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ABSTRACT

A workshop on the distribution and use of electronic aids in education was held at St. Donat, Quebec. Workshop members discussed the advantages of and obstacles to use of these aids and suggested ways by which their use could be increased. A frequent suggestion was to set up distribution boards at the national and regional level to facilitate access to materials. The background papers for the workshop explored ways to choose appropriate educational materials, described the implications for society of increasing post-secondary school enrollment, and summarized information about five basic systems of storing video information for replay through television receivers or monitors. Other papers compared ways of delivering television programs to the classroom on the bases of cost and merit, described the use of television for information retrieval, suggested objectives and alternatives for an educational distribution organization, and outlined a system for distributing educational material on videotape. (JK)

ED054607

WORKSHOP PROCEEDINGS | COMPTE-RENDU DE L'ATELIER

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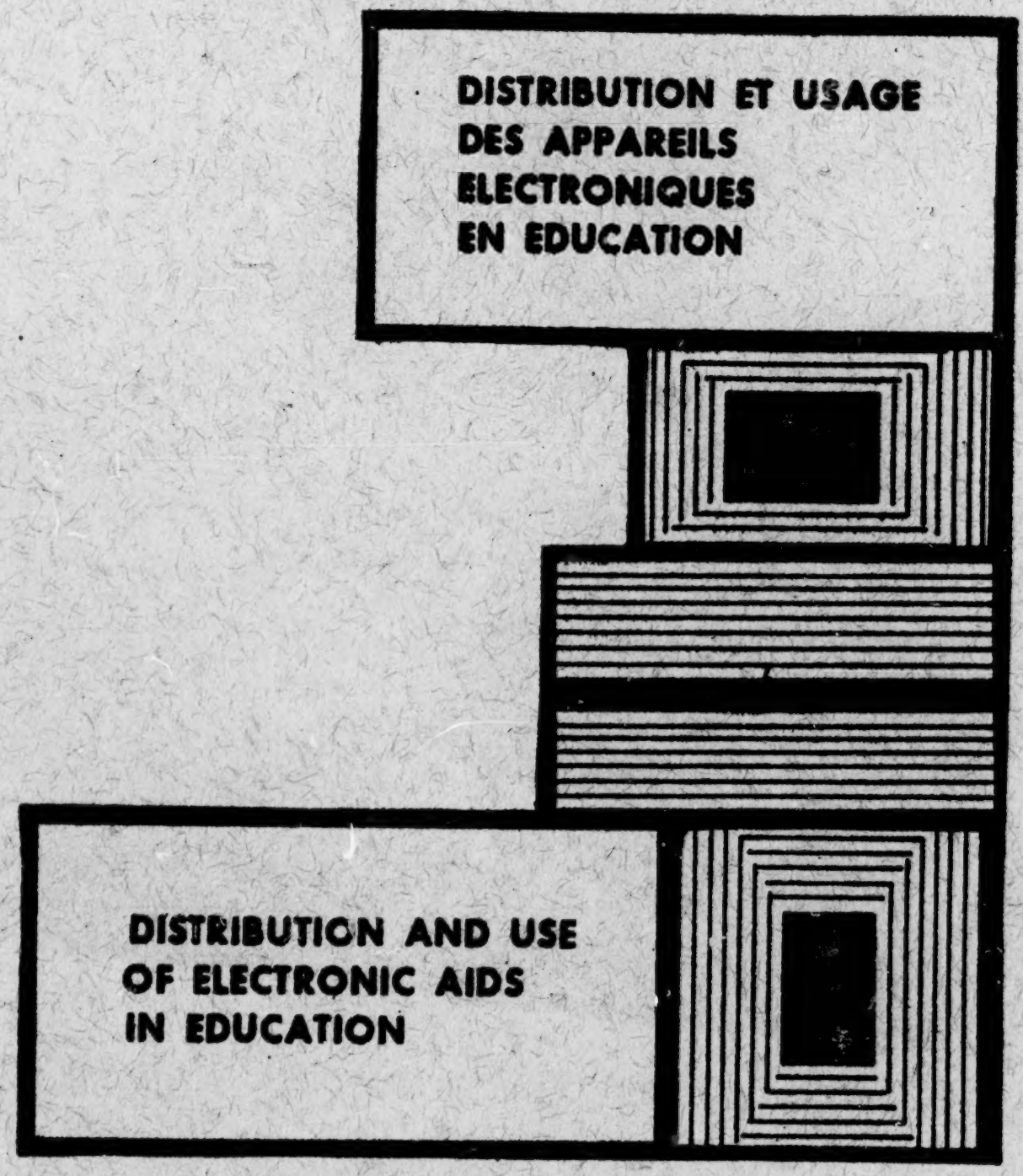
1970

St Donat, Québec

DISTRIBUTION ET USAGE DES APPAREILS ELECTRONIQUES EN EDUCATION



DISTRIBUTION AND USE OF ELECTRONIC AIDS IN EDUCATION

EM 009 189

Canadian Council for Research in Education | Conseil canadien pour la recherche en éducation

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FOREWORD

The Workshop on The Distribution and Use of Electronic Educational Materials developed as a result of the concern of a small number of persons with the continuing failure in Canada to utilize fully the tremendous educational potential of the new technologies. Technologies that already exist are not yet being employed fully in education while new technologies are arriving on the scene. Two major defects are evident:

- The absence of any effective system for the distribution of "software",

- The lack of commonly accepted equipment standards for "hardware".

Direct planning for the Workshop began in the late Spring of 1970. The Canadian Council for Research in Education agreed to act as sponsor; financial assistance was obtained from the Canada Department of Industry, Trade and Commerce; and a small Planning Committee was established. A considerable part of the success of the Workshop is due to the work of this Planning Committee. Most of the members of the Planning Committee, C.A. Billowes, R. McLorg, G. Richert, L. Samuel and F.E. Whitworth and myself, were in attendance at the Workshop and thereby able to share in the benefits of their earlier efforts. Two members of the Planning Committee, J. Brahan of the National Research Council and R. Mosher of the Canadian Teachers' Federation, were unable to attend. On behalf of the sponsoring agency, CCRE, I wish to extend sincere thanks to all of them for their generous assistance. I wish also to express thanks to the Canada Department of Industry, Trade and Commerce for the financial assistance which made the Workshop possible.

The success of the Workshop was also due in part to the high quality of the eight papers prepared in advance of the Workshop to serve as background material for the discussions, and our sincere thanks go also to the authors of these papers. These papers are published here as part of the Proceedings.

The excellent accommodations and courteous service provided by Hôtel La Réserve and its staff contributed in their own way to the success of the Workshop and our warm appreciation to the staff for their service is here recorded. A vote of thanks goes also to Léo Desmarteau of the CCRE staff for his effective work in coordinating arrangements.

The major cause of the success of the Workshop, however, was the participants themselves. Those who were invited constituted a group of knowledgeable and experienced persons with a wide variety of backgrounds from education, government and industry united by a common concern for improving the educational potential of the newer electronic materials. The sense of urgency shared by the participants permeated the Workshop deliberations and served as the stimulus to produce a strong consensus among the participants both on what should be done and on how best to go about doing it.

The Workshop format, with its emphasis on small group discussion focussed on specific topics for which background material had been prepared in advance, assisted substantially in sustaining the discussions. With four discussion groups of some eight members each, there was ample opportunity for individual participation and sustained discussion. The congenial en-

vironment and the relaxed atmosphere contributed too. Although the majority of the participants were from backgrounds where English is the predominant language, a modest though effective bilingual atmosphere was created and sustained, with members of the various discussion groups participating in the language of their choice and reports to the plenary sessions being given in the two official languages of Canada. Future workshops should undertake to strengthen this aspect of proceedings, but a good beginning was made here.

The fact that some members of the Workshop did not receive advance copies of some of the background papers only served to emphasize the value of making these papers available in advance. However, this is another matter that should be given more careful attention in the future in order to ensure that all participants receive material in advance. A plenary session on the evening of the second day devoted to reviewing the planning and programming of the Workshop also produced suggestions that future workshops undertake to improve the correlation between the prepared papers and the particular small group discussion topics for which these serve as background. In addition, some participants felt that insufficient time was allowed for discussion of assigned topics in small groups, with too much pressure to reconvene for plenary sessions and reporting. But this may be interpreted either as a weakness in the programming or as a sign of successful programming, as reflected in the enthusiasm of the participants. Still, future planning of similar workshops should review this matter.

At the conclusion of the Workshop a clear consensus emerged on two basic recommendations:

1) that there is an urgent need immediately to investigate the feasibility of establishing a Canadian agency to serve as a means of improving the distribution of electronic educational materials and of coordinating information about developments in this field;

2) that there is a need to establish a Canada-wide exchange of information on equipment standards in this field.

The ad hoc Planning Committee was asked to remain in existence in order to explore means of implementing these recommendations. Members of this Committee agreed and, with CCRE acting as secretariat, two meetings of this Committee were held in December of 1970. As a result, a proposal for a Research Study has been drafted (published as an Appendix to these Proceedings, pp. 45 - 47) and the Committee is currently seeking support for the conduct of such a study. The real measure of the success of this Workshop will be found in the response to this proposal.

Edward J. Monahan

AVANT-PROPOS

La nécessité d'utiliser adéquatement et pleinement le grand nombre d'appareils technologiques d'enseignement a suscité un vif intérêt chez certains chercheurs et administrateurs qui ont par la suite formulé le désir d'investiguer le sujet. Avant même qu'une technologie soit exploitée, plusieurs autres apparaissent sur le marché. Lors d'une première réunion, ceux qui allaient constituer le Comité de planification pour l'Atelier reconnaissaient deux lacunes évidentes:

- L'absence d'un système efficace de distribution du matériel de soutien.

- Le manque d'uniformité ou de transférabilité des appareils.

Dès lors (printemps 1970) un Comité de planification entreprend d'organiser un Atelier sur la Distribution et l'utilisation des appareils électroniques d'enseignement. Le Conseil canadien pour la recherche en éducation accepte les auspices de l'Atelier et le ministère fédéral de l'Industrie et du Commerce offre l'aide financière nécessaire.

Les efforts soutenus du comité de planification, la collaboration dévouée de l'Hôtel La Réserve, la qualité des mémoires et surtout la bonne volonté et l'intérêt des membres de l'Atelier ont fabriqué le succès des délibérations et conséquemment la valeur des pages qui suivent.

Le comité de planification, formé de Messieurs C.A. Billowes, J.R. McLorg, G.E. Richert, L.L. Samuel, F.E. Whitworth et moi-même (présents lors de l'atelier) ainsi que Messieurs J. Brahan et R. Mosher qui n'ont pu participer aux assises, a su mener à bien les préparatifs de cette entreprise. Le ministère fédéral de l'Industrie et du Commerce a assuré le soutien financier.

Quelque 8 experts ont de plus dévoué une partie de leur temps à la préparation de mémoires de base qui ont adéquatement nourri et orienté les discussions. Ces documents sont inclus ci-après comme partie du compte-rendu de l'Atelier. Nos remerciements vont aussi à M. Léo M. Desmarteau, du personnel du C.C.R.E. pour son travail efficace dans la coordination de tous les arrangements.

Qu'il me soit permis, au nom du C.C.R.E. de remercier chaleureusement ces collaborateurs et tous les autres qui de près ou de loin ont contribué au succès de l'Atelier.

Bien entendu tout effort eut été vain sans l'engagement complet de tous les participants dans le déroulement des discussions. De provenances diverses (éducation, gouvernement et industrie) les individus présents ont confronté des points de vue et des intérêts différents pour en arriver à des recommandations exhaustives, couvrant les différents aspects du problème de la distribution et de l'utilisation des appareils électroniques d'enseignement.

La formule et l'horaire adoptés lors de l'Atelier ont reçu l'approbation générale à une session vouée à l'évaluation des procédures. Il en a résulté un appui formel pour 1) la réception et la lecture au préalable des mémoires et textes de base; 2) une forte proportion du temps disponible pour les discussions en petits groupes; et 3) la possibilité de communiquer en réunions plénières les fruits des discussions en petits groupes.

Le climat de liberté de parole et de bonne entente a ouvert la porte à des échanges dans les deux langues officielles du pays. Plusieurs personnes de langue anglaise ont voulu s'exprimer en français et plusieurs personnes de langue française se sont exprimées en anglais.

Tel que reconnu par tous les participants, le besoin urgent d'étudier les possibilités de distribution sur le plan national et d'échanger toute information reliée aux appareils électroniques d'enseignement a poussé le comité de planification à poursuivre les idées émises lors de l'Atelier pour les mener à bonne fin. Les membres de ce comité et le C.C.R.E., qui joue le rôle de secrétariat, en sont arrivés à la préparation d'un projet de recherche expliqué ci-après en appendice. Le succès de l'Atelier se mesurera désormais aux résultats qu'obtiendra cette tentative.

Une dernière mise au point s'impose. A cause de la nécessité de publier de compte-rendu le plus tôt possible, nous avons été dans l'impossibilité de faire traduire les textes soumis qui ont tous été rédigés en langue anglaise.

Edward J. Monahan

SUMMARY OF WORKSHOP DELIBERATIONS/
RESUME DES PROCEDURES DE L'ATELIER

SUMMARY OF WORKSHOP DELIBERATIONS

DAY 1

Introduction

Prior to entering into any detailed examination of specific problems affecting the use of the various electronic educational materials and of problems involved in improving the distribution of these materials some time was given over to an introductory discussion of the general situation of contemporary education in Canada and of the potential roles the new electronic materials might play in assisting to improve education.

The morning of Day 1 was devoted to small group discussions of the value of electronic educational materials in the educational process, particularly as this process involves students and teachers. The morning discussions also served as get-acquainted brain-storming sessions for Workshop participants.

Information on current financial aspects of Canadian education, an important element in the background, was provided through a summary of Dr. Wisenthal's paper presented by the author at the opening plenary session.

The afternoon of Day 1 was again devoted to small group discussions. During this period attention was focussed on Educational Materials Employing Playback Micro-Imagery, particularly The Development of Video Equipment. Workshop participants first assembled briefly in a plenary session to receive an outline of these topics.

One of the major problems affecting distribution of electronic educational materials involves the wide variety of available systems employing micro-imagery. A number of different systems are available, video reels, video cassettes, micro-film, microfiche, film loops, film strips, etc. And more may soon be developed. Each system has its peculiar assets and liabilities, some of which are common to several systems.

At the present time, a number of factors inhibit the full, effective use of these systems:

1. Potential users often lack the requisite knowledge to decide which system(s) will best serve their particular educational needs.

2. Adequate means of providing ready distribution of these materials do not now exist in Canada.

3. "Packaged" educational materials currently available are not interchangeable among the different systems.

Because of its special significance, particular attention was given during this afternoon session to an examination of the development of video playback equipment. During the next year a whole new generation of electronic equipment will become available to educators. This equipment will employ video cassettes, which the user simply inserts and then removes at will. The cost of such equipment will be modest, $150 - $400 per unit, without the cassettes, and the great flexibility provided by the cassettes gives the equipment high educational potential.

However, there a number of major problems. The educational community may expect to be approached by a number of different equipment manufacturers selling four completely different systems. Since materials prepared by the various manufacturers for use in their equipment are not interchangeable among the different types of equipment, a user will be "locked in" to the equipment and materials of the system chosen. At present integration among the systems is impossible.

If measures are to be taken to provide integration of various materials for use in different types of equipment, it will be necessary to establish standards for equipment and then to provide adequate means for distribution. Any such developments should take into account the educational objectives to be served by such systems. A pre-condition for this is a careful delineation of the requirements educators have for such electronic educational aids. Only after these requirements have been established and agreed upon can proper attention be given to developing effective means for improving distribution.

Background Papers

L.D. McLean	"What's It Good For - How Do I Know? Choosing Educational Materials"	(page 17)
M. Wisenthal	"The Threat of Increasing Numbers and Costs in Post-Secondary Education"	(page 24)
E.F.V. Robinson	"Video Recording and Playback Systems"	(page 32)
L.L. Samuel	"The Impact of Video Playback Systems"	(page 35)

Team Reports

Workshop participants reconvened on the evening of Day 1 to hear reports from each of the four discussion teams and for discussion of them. The following are summaries of the reports presented by the various teams. It is noted that the report of Team 2 concentrates on the educationally desirable characteristics of various electronic materials. Team 1 comes out strongly in favour of establishing rigid equipment standards.

Team 1

It is recommended that for the immediate future there be standardization on a small width video tape recorder player of the cassette type*, built to an international manufacturing standard; and that a cooperative Canada-wide distribution system be organized to handle materials in this form. (Master tapes, of course, could be made in any medium.)

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*At the time of the Conference information existed that there was likely to be a single universal standard cassette VTR. Since then new information has emerged which indicates that there may be two incompatible small width cassette VTRs. The intent of the recommendation was that the most popular version of the cassette VTR be adopted.

It is strongly recommended further that the adoption of other replay technologies, such as TELDEC, EVR, etc. be discouraged or outlawed, except for experimental purposes.

The reasons given for these recommendations are:

1. This VTR meets most of the needs of education as well or better than other devices: the device allows both recording and playback; VTR is a proven technology; tapes are reusable and their reliability continues to improve; bilingual facility can be achieved via a double sound track.

2. Other technologies are either more limiting or not yet proven.

3. Failure to take a decision now will result inevitably in a proliferation of incompatible systems. This result will be bad because:

   a) it will render difficult and costly any interprovincial or international exchange of educational materials and thereby seriously reduce prospects for such exchange;

   b) it will cause a loss of potential cost advantages within provinces among school boards, with the result that only the more prosperous provinces and school boards will be able to afford widespread use of the technology.

4. Previewing of materials will be easier and less expensive.

5. Given such a unified market in Canada, a Canadian industry has a chance to develop with an export potential as well.

6. The existence of a general distribution system will encourage production of educational materials with Canadian content by Canadian agencies such as colleges, universities and provincial departments of education.

These recommendations should be reviewed no later than five years from the date of their implementation. Existing agencies such as NRC and NFB with the facilities to test and evaluate new developments should maintain a watching brief so that no superior system will be overlooked when developed.

Team 2

In considering what factors are of importance in evaluating the characteristics of a technology in terms of its acceptance by educators, the following list has been prepared. The factors mentioned here are listed in order of priority.

1. Teacher or user control.

2. Delivery time to recipient.

3. Cost of software.

4. Size of the available library.

5. Capability of recording and making copies

6. Cost of hardware

7. Random access

8. Stop-frame capability

9. Colour

Considerable doubt was expressed as to whether any specific technology is likely to come into widespread use (in 50% or more of Canadian schools) within the next five years. Some of the obstacles to widespread use were seen to be:

1. Costs

2. Inadequacies in planning and distribution

3. Necessity of changes in instructional patterns

4. Incompatibility of available equipment

5. Political realities in Canada -- each educational problem must be solved ten times

Team 3

General discussion in this Team produced agreement that the following points are important:

1. There is a need to define more clearly the role of the learner and the teacher if a school is to be organized to take real advantage of the educational potential of these newer media.

2. There is a need to evaluate carefully the possibilities of the various newer media in order to discover what each can do, what the costs are, etc.

3. There is a need for pilot projects to determine ways of increasing efficiency, e.g., a suggestion was made that the overall pupil-teacher ratio might be reduced by dividing the students into two groups, each of which would attend school half-time (Monday, Wednesday and Friday one week, Tuesday and Thursday the next week, alternately) with modern media such as TV video cassettes, etc. being employed during the remaining time.

4. Prior to the purchase of technological equipment (whether new or old) there is need to be certain that the equipment will be used effectively by those who employ it. The purchaser should have decided that this equipment will do more educationally than can be done without it; or that it can do the job more quickly or more economically.

Team 4

Members of the Team agreed that when electronic materials are employed in education they are only means to educational ends and therefore that the goals developed in connection with their use should be formulated in terms of educational objectives, not in terms of the techniques themselves. They also agreed on the following observations and recommendations:

1. The growth of the new technology should be in the direction of providing the individual user with increased access to the materials, with a high premium being placed on the availability of a wide choice of materials.

2. The development of additional new technologies can be expected, even within the next five years.

3. Some existing, simple technologies have not yet been exploited adequately by educators in some situations and certain communities; these technologies should not be ignored.

4. Educational technologies employing electronic means will be the fastest growing in terms of use. The interaction of these with the older technologies will teach us most about possibilities for new applications and further development.

Among the major obstacles to increased use of the new technologies are the following:

1. To date in Canada there has been very little research or evaluation on the use of video recording and playback equipment in education.

2. Even when provided with an opportunity to employ the new technologies, educational planners in Canada often prefer to retain the present systems rather than introduce radically new ones.

3. Persons responsible for making educational policy in Canada often lack basic information about the role and value of the new educational technologies.

4. There is very little discussion between educators and manufacturers concerning the potential uses of the new technologies in Canada.

The Team placed a high priority on the ability of video playback systems to accept various formats, in preference to standardizing on one format and made two recommendations;

It is recommended that there should be a greater availability of inexpensive and rapid local dubbing and conversion facilities, in order to facilitate the exchange of video recorded materials in various formats.

It is recommended that greater durability be provided in recorders and playback equipment, both on materials used directly by students and on materials used by instructors when portability is essential.

The Team also agreed that for certain kinds of recorded material, for example, those employing charts and diagrams as well as texts, stop-frame capacity was essential; that the development of inter-provincial standards for equipment is essential; and that video recording will achieve its greatest value if home use is linked with school or community use.

DAY II

Morning Session

Introduction

The second day of the Workshop was devoted to two different topics. The morning session continued examination of various forms of electronic educational materials, this time focussing on Forms of Electronic Television Communication. Assembling in plenary session to begin the morning discussion, the participants were briefed on the basic characteristics of the topic as follows.

The same sorts of problems affecting distribution and use of educational materials via Television exist with materials employing micro-imagery. By mid-1971 three quite different approaches to the communication of educational materials through the medium of television will be available.

1. Community Broadcast Tower Stations
2. IRTV cable distribution direct to the classroom
3. Video tape playback units, etc. linked to a central distribution system.

One potential problem of considerable magnitude results from the fact that proponents of the various systems often vie with one another in efforts to achieve ascendancy or even dominance in the field. Given limitations in funds, particularly stringent in certain regions of Canada, this problem can become very grave. The primary consideration should be to arrive at sound practical judgments on which system to use, judgments based on the value of the particular system to serve the given educational needs.

It can be assumed that each system can serve to assist in the educational process. Still, each has its own strengchs and weaknesses, and each has its own contribution to make given differing educational needs. What is required is a comprehensive assessment of the various T.V. systems from the viewpoint of different educational objectives.

Background Papers

C.A. Billowes	"Educational Television Distribution, A Comparison of Methods" (page 38)
Dennis H. Dibb	"Information Retrieval Television" (page 48)

Team Reports

The participants reconvened in plenary session immediately before lunch to hear reports from various teams. Not all teams presented reports and only one is summarized here. This is the Report of Team 2 which provides a useful check-list of those educational areas where the various ETV systems might usefully be employed. Other Team reports and the ensuing discussion supported this outline.

CHECK-LIST OF EDUCATIONAL ENVIRONMENTS
IN WHICH VARIOUS ELECTRONIC SYSTEMS
CAN BE USED TO ADVANTAGE

	BROADCASTING	CABLE	VIDEO-PLAYBACK
PRIM / SEC URBAN	✓	✓	✓
PRIM / SEC RURAL	✓		✓
COMM. COLL.			✓
UNIVERSITY		✓	✓
ADULT - HOME	✓	URBAN ✓	RENTAL/TAPES ✓
COMM. DEVELOP.	✓	✓	✓

DAY II

Afternoon Session

Introduction

After devoting a day and a half to consideration of the assets and liabilities of the various electronic educational materials, on the afternoon of Day II attention turned to explicit consideration of problems affecting the distribution of these materials, in particular to proposals for the development of a General Framework for Improved Distribution.

In the face of a rapidly developing technology and the immediate prospect of a flood of competing electronics systems on the educational market, it is imperative that careful attention should be given to solving present problems of distribution. Therefore, the participants devoted the afternoon to a serious examination of the need for and the feasibility of establishing some machinery to provide efficient, widespread distribution of these educational materials in Canada. One background paper provided for the session presented an outline of alternative models for a Canadian Educational Distribution Organization. A second described briefly how one Canadian province at present distributes educational materials on video tape.

Background Papers

J.R. McLorg: "Objectives and Alternatives for an Educational Distribution Organization" (page 51)

R.A. Morton: "Distributing Educational Materials Through Video-Tape" (page 57)

Team Reports

At the plenary session closing the afternoon discussions each of the four teams presented a report with recommendations. Although there was a difference in approach by several of the teams and a lack of consistency in the recommendations taken as a whole, a number of important recommendations emerged from this session. Summaries of the Team reports follow.

Team 1

The Team recommended the establishment of a Canada-wide distribution agency to serve any legitimate educational or training need providing it was not for profit. Such an agency would deal only with those materials for which it was able to obtain exclusive distribution rights. It would produce and keep up to date an annotated catalogue of materials available for distribution. These materials would be sold only, at a price sufficient to enable the agency to continue to provide such services.

The Team also recommended an immediate pilot study to explore the feasibility of this proposal.

Team 2

This Team recommended immediate action to establish a central information system on available electronic educational materials, urging that the system be established by May 1971. The Team considered that this proposal should be presented to the Council of Ministers for their support and that the Canadian content, in English and French, of such materials should be emphasized. The Team also stressed the need for establishing Canada-wide equipment standards and expressed its opinion that industrial support could be gained for the establishment of a central information system. Considerations of cost were avoided.

The Team suggested that these facilities likely would first be used by community colleges (CAATs and CEGEPs) and then by secondary schools.

Team 3

The Team recommended the establishment of a National Distribution Board, with provincial representation, to develop a union catalogue of educational films and video tapes; and to work out problems affecting copyright and distribution in conjunction with such agencies as the CBC and the NFB.

The Team envisaged the establishment of regional centres of the Board, each of which would coordinate the production and distribution of educational materials for its region. Local school units would deal with their respective regional centre.

The Team suggested that use of such facilities might begin at the technical and vocational school level, then extent to secondary schools and primary schools, and finally be used at the post-secondary level.

Team 4

The Team recommended the establishment of a Canadian distribution agency for electronic educational materials. The agency would begin as a clearing house for information about these materials; then move into the business of producing an annotated catalogue of materials; and finally undertake the stocking of materials for distribution.

In order to proceed to the establishment of such an agency, the Team recommended that detailed terms of reference be drafted, a sponsor obtained (such as ETRAC), and a budget of some $100,000.00 be acquired for the establishment of a secretariat. They urged that a Feasibility Conference on such a project be held in late 1971, with a target date of September 1972 set for the establishment of the agency.

DAY III - CONCLUDING SESSION

The final half-day of the Workshop was devoted to considerations of how to follow up on the stimulus provided by the discussions with a programme of action. After a short period working in small groups on specific recommendations for action, participants reconvened in plenary session to hear the Team reports and discuss them. Summaries of the reports presented by the four Teams to the final plenary session summarized here contain the recommendations of

the Workshop participants on how to proceed to implement the agreed-upon objectives for the improvement of the distribution and use of electronic educational materials.

Team Reports

Team 1

Since the widespread use of electronic educational aids is seen as one means of reducing the rate of increase in educational costs, and

Since no one organization (whether public or private) possesses the resources to produce the large quantity of new programming, including supporting materials and services, necessary to realize the full potential of these technologies, the creation of a small organization is necessary to implement the specific proposals for collection and distribution that have been made at this Workshop.

Therefore it is recommended that the Workshop Planning Committee be charged with the responsibility of implementing the major recommendations of this Workshop, using the services of CCRE as a secretariat and drawing on the resources available through the Workshop participants.

More specifically, it is recommended that a pilot project be developed to demonstrate the advantages to education, to industry, and to the Canadian taxpayer to be gained through regular exchange of programmes available by means of these materials.

Team 2

1. It is recommended that CCRE be recruited to design and undertake immediately a pilot project, the specific objective of which would be to propose means of achieving large scale economies in the instructional costs of education.

2. It is recommended that pilot projects be developed whose aim is to design and assess systems involving electronic aids, e.g. apply VTR to the teaching of a subject, preferably in the sciences, integrating its use with the use of non-competing electronic aids. Such a subject should be one already taught by conventional methods and the object of the pilot study would be to assess the relative instructional effectiveness and the costs of the two methods.

3. It is recommended that an immediate investigation be made into the following possibilities:

    1) coordination of information on available electronic instructional materials;

    2) selection, assembling and organization of these materials;

3) rendering these materials available by means of an effective and economical system of distribution;

4) establishment of means to generate new materials as needed.

It is also recommended that this investigation be conducted by ETRAC, CMEC, or some such organization; and that the implementation of these possibilities be undertaken as soon as possible by an organization which might be selected.

Team 3

It is recommended that a delegate from this Workshop should carry specific recommendations to the Council of Ministers of Education urging that the Council support financially for a period of up to one year the work of one person, to be attached to a national organization such as CCRE, to carry out the work preliminary to establishing more effective distribution of electronic educational materials in Canada. This person would be responsible for outlining a set of possible Canada-wide standards covering the use of electronic media in education with a view to achieving Canada-wide agreement on the proposed standards.

Those responsible for education in Canada are urged to consider the urgent need for a national distribution system for electronic educational materials, which system would:

1) increase the availability of materials to individual users through the development of a system enabling exchange across provinces and regions in Canada;

2) reduce the costs of information systems by introducing economies of scale made possible by Canada-wide distribution and use;

3) foster nationally agreed-upon standards for information systems, thereby increasing the prospect that the equipment and programmes of such systems be Canadian in origin and content (compatibility of information systems employing widely educational materials developed in various regions would contribute to Canadian unity); and

4) stimulate the Canadian electronics industry by encouraging, through national standards, development of a Canadian market for electronic information systems.

It is recommended that a pilot study be undertaken to develop a broad-based Canadian Electronic Systems Applications Authority (CESAA), which authority would promote Canadian industrial potential through the development of technically advanced information systems for the dissemination of information through electronic display devices. CESAA would also strengthen Canadian identity; bring about cost savings; and increase opportunities for export use abroad of these technically advanced systems.

Team 4

Although most members of this Team agreed substantially with the recommendations from the other Teams on the need for a distribution agency, some members of this Team entered a Minority Report. It recommended against the establishment of a central distribution agency as being too complex and

cumbersome. Instead, it recommended the development of simple catalogue (or directory) of available materials as a means of assisting users to learn what materials are available.

At the conclusion of the final plenary session, the Acting Director of CCRE announced that CCRE was willing to continue to serve in a secretarial capacity for on-going activities and that he would arrange an early meeting of the Planning Committee to discuss implementation of some of the major recommendations emerging from the Workshop.

BACKGROUND PAPERS/MEMOIRES DE FOND

WHAT'S IT GOOD FOR -- HOW DO I KNOW?
CHOOSING EDUCATIONAL MATERIALS

Leslie D. McLean*

This paper is concerned with the information a person needs when choosing some pre-packaged educational materials to meet predetermined learning goals. Some information is relevant only to electronic materials, but the important concerns are general ones. It is felt that potential users of educational materials lack the requisite knowledge to decide which systems will best serve their educational needs.

Potential users will include trainees in industry in addition to other students at the secondary and post-secondary levels of formal schooling; we will call them learners. In fact, the users who need information most under our present systems are training officers and instructors; we will call them teachers; teachers guide the choice of materials for learners. Teachers will also be "choosing" when they act as authors using automated systems such as computer aided learning. Good information about the characteristics of the materials is even more important when decisions have been made in advance and coded into the logic of complex, individualized instructional systems.

Discussion will concentrate on the following major shortcomings which increase the difficulty of choosing any educational materials.

1. The learning goals are unclear.
2. The content is inadequately described.
3. Evidence is lacking as to:
   a. Validity of stated prerequisites,
   b. appropriateness of suggested methods,
   c. success in meeting objectives.
4. Some essential features of the delivery system are not specified.

After choosing materials one often encounters additional problems such as:

5. Inadequate provision for the improvement and updating of materials.
6. Weak or non-existent tests for achievement of goals or mastery of skills.
7. Lack of information as to logical or planned follow-up lessons or activities.
8. Poor provision for feedback to the learners and from the learners to the teacher.

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What Are Electronic Materials? What (Who) Are Learners?

For purposes of this discussion, we will concentrate on materials for computer aided instruction and on films, video-tapes, and cassettes which feed easily into electronic distribution systems. The ideal set of materials, however, seems to be a "package" containing a teacher's guide and the learning materials. The teacher's guide must include a careful description of the materials, suggestions as to how they might best be studied and lists of the necessary resources. The materials should include diagnostic tasks or tests along with criterion tasks or tests which the learner can use to judge his own success. There must also be provision for feedback to the teacher, since the teacher is successful if and only if the learner succeeds. In his lecture, "Telling it like it ain't", Dr. Neil Postman pointed out how absurd it is for anyone to say, "He still doesn't know it and I've taught it to him four times already."

We have to be serious in our espousal of the systems approach, extending systems concepts to the learning materials we produce. Diagnostic tests are required to monitor learner inputs; the teacher's guide helps to control the process of learning; the criterion tests provide data for feedback and for the decision logic guiding next steps for the learner and the teacher. More important, we have not only to recognize but also to act on the fact that human processes are different from industrial processes.

The learner will be (whether we like it or not) a much more active participant in the process. Evidence is appearing from research that significant gains in learner success can be achieved by giving the learner some control over the sequence of study, including the opportunity to follow study paths which the teacher believes are questionable, if not positively harmful!

In summary, "Electronic materials" should include:

1. directions for use,
2. diagnostic tests to reveal potential learner difficulties,
3. the content -- what is to be learned,
4. criterion questions on tasks for the learner to test his mastery of the content, and
5. explicit provision for feedback to the learner and to the teacher.

"Learners" are people.

How Should Materials Be Described to Potential Users?

The major shortcomings of materials have already been mentioned. Each of these will be discussed but in its positive form. Here's a

checklist for producers of materials.

Provide a Clear Statement of Learning Goals:

Much ado has been made of behavioural objectives in the last few years. One could simply not hold up one's head at professional meetings unless several new objectives were at the tip of one's tongue, ready to be described in terms of learner behaviour. That ecstatic phase has subsided, but there are now behavioural objective banks (in the U.S.) and exchanges, the instructional technologist's stock in trade. What we have learned from these missionaries is that we can specify, more often than we were willing to admit, exactly what we wanted the students to be able to do after completing our prepared courses of study. Moreover, after taking the trouble to be so specific, our evaluation problems largely disappeared as criterion tests became obvious. Also, learners were let in on the secrets for the first time and responded with, "Is that what you wanted; why didn't you say so?" or, "What nonsense; I already know how to do that and it's completely useless." Where the goals are clearly understood and where they involve repetitive skills, behavioural objectives are invaluable. In particular, they facilitate the rejection of irrelevant materials, thus saving considerable time. If the goal of instruction is a set of identifiable skills, then please say so in the materials description and do not try to dress them up with peripheral hogwash such as appreciation of this and a liking for that.

So what do you do if your goals are more complex? Honesty is the best policy. Say (in writing) that you had multiple goals, not all of which were clear, and describe the context in which the materials were used. The section on evidence (below) will then become the most relevant in the materials description.

There is, of course, middle ground. The goal is to learn to answer some questions, for example. There has been the same tendency to abstract the questions, to identify some higher truth to be attained -- more hogwash. Provide a representative set of questions and write,"The goal is to enable the learner to answer these questions to the satisfaction of the teacher." Don't worry that the learners may see the questions; unlike our own school experience, learning is not a contest between the pupil and the teacher. It is the teacher's job to "give" the learners the answers. One of the best ways is first to give the students the questions! (Research bears this out very strongly.) Conclusion: Your questions often describe your goals -- let prospective users see your questions.

Describe the Content of the Materials as Fully as Space Permits

Little can be said of this beyond the heading. Remember,however, that the diagnostic and evaluation sections are very much part of the content. Here are two good examples of content description:

A. C. Fundamentals - Capacitance

Objective

For review or initial learning of fundamental resonance concepts. Prerequisites: Grade 9 achievement in Math., fundamentals of electricity, and other units in A.C. theory.

Content

Introduction review, colour coding, capacitance charges and discharges, construction and basic types of capacitor, symbols used, function in D.C. and A.C. circuits, effect of changes in frequency and capacitance, calculations and formulas for capacitive reactance, current and voltage in a capacitive circuit, total capacitance in series and parallel circuits; phase relationship of current and voltage, formula for impedance in series R.C. circuits, formula for total current and parallel R.C. circuits.

Media, Learning Time and Application

Linear programmed instruction. Learning time 6 hours. No lab experiments. Available only by direct negotiation particularly re proper application of the material. This unit is part of a total series on A.C. Fundamentals. Contact: 11A.

* * * * * *

LEARNING TO SET TYPE: (JS) Demonstrates the basic principles of typesetting and distribution. Stresses correct ways of manipulating the type, "spotting" letters before they are selected, care needed during distribution, and the importance of following copy and correction errors. Helps shorten the learning period, provides a foundation for increased accuracy and speed, instills a respect for printers' type, and reinforces good working habits. Produced by Whitten-Appleton. 11 min., B & W - $60.

Here are two bad ones:

Meteorology
TEMAC No: 59125

A programmed unit for 7th. 8th. and 9th. grade general science and contains basic information and relationships essential for understanding meteorology.

Text and Supplement.....$3.00
Teacher's Manual
(TEMAC No. 59123).....$1.00

Astronomy
TEMAC No. 59175

A programmed unit for 7th, 8th, and 9th. grade general science which develops basic understandings about the earth, solar system and the stars.

Text and Supplement.....$3.00
Teacher's Manual
(TEMAC No. 59173).....$1.00

* * * * * *

State Your Evidence -- or Lack Thereof

Prerequisite skills or knowledge are often stated, usually without justification. If you are offering an informal guess, say so. If you have relevant experience, summarize it. If you haven't a clue, keep quiet. 'Tis far worse to frighten off the highly motivated beginner than to frustrate him a bit. Be clear about the intended preparation (such as earlier works in a series) but let your diagnostic tests do the screening. See points 5 - 8 at the beginning of this paper.

Do not hesitate to describe a method of presentation which has worked well. Suppress the desire to suggest untried methods. Use this section of the description to be specific about the learners who have already been through the material; when in doubt, give details (age, language spoken, jobs held, years of experience, formal schooling,...) The potential user should be able to tell whether this material has worked with people like him and how.

Obtain evaluations of the study program and share these with potential users. Tell how many were able to do what after studying the material. If you haven't followed up, say so and say why you still offer the materials.

Devote a Separate Section to the Delivery System

A unique concern with electronic materials is the technology needed to give the learner access to the content. We are dealing with materials on film, magnetic tape or in computer memories. Specifying "video-tape" is not enough, as anyone will testify who has tried to play a 1" Sony tape on 1" IVC or Ampex. Materials designed for computer assisted instruction are hopelessly system-bound at present. The only solution in the near future is to describe in detail the actual devices used by the originator. Here is a good description (from ENTELEK)

Program Name	1. DECOMPOSITION OF NUMBERS
Subject matter	1a. Arithmetic practice in primes, factors exponential notation
Author(s)	2. Beatts, P.M.
Target population	3. Elementary school students (grades 4 - 6)

Curriculum relationships (e.g.prerequisites)	4. Ability to a) read and b)add, subtract, multiply and divide
Length of program	5. 1 - 3 hours of student time
Instructional logic (e.g.tutorial socratic)	6. Tutorial
Instructional language (e.g. COURSEWRITER) and/or compiler	7. COURSEWRITER
Computer(s) (inc.storage requirements)	8. IBM 1500 System
I/O Devices	9. IBM 1510 keyboard and CRT terminal
Auxiliary equipment or materials (e.g.notebooks projectors)	10. Paper and pencil
Performance results (e.g. published reports)	11. No published results
Installations	12. IBM Education Research Dept., San Jose, Calif.
Availability	13. Not presently available
Related ENTELEK Program and Research Abstracts	14. --
Source documents	15. Specifications submitted by author in June 1968
Sponsoring agency	16. Internal support from IBM Education Research Dept.,San Jose

As courses on computer systems become more sophisticated, the job of description becomes more difficult. Only a detailed flowchart is adequate to describe all the possibilities, and this is obviously too detailed for the average reader. Teachers selecting material, however will have to learn to read flowcharts. A set of materials being prepared at OISE for diagnosis and remediation of math skills deficiencies, for example, will employ a branching diagnosis program which contains decision logic based on probabilities of successful performance. The probabilities are derived from student performance and are constantly updated. Remedial instruction will be tailored to the student's error pattern and hence will be difficult to specify in a general way. Early evidence points to a 50% increase in learning efficiency by use of this method. When shopping for a course, you may have to decide on the basis of the goals and the evidence of success unless you want to get into the flowchart book.

Summary: The State of the Art

Descriptions of content and media are usually good. It was difficult to find bad examples. There is almost never any evidence of the successful performance of the materials, however, or details as to the type of learner for which materials are best suited. Teaching methods are likewise given short shrift, even though it would be useful to have some suggestions for most efficient use of linear programmed instruction. Packages of materials require some suggestions for their most efficient use.

Diagnostic and criterion tests are absent from every piece of material consulted to date. The diagnosis section is optional for simple material but will surely be necessary for CAI courses. Absence of criterion measures is a serious deficiency. It is not a pleasure to see that caveat emptor applies especially forcefully to educational materials.

THE THREAT OF INCREASING NUMBERS AND COSTS IN POST-SECONDARY EDUCATION*

Miles Wisenthal**

The title of this paper suggests that there is cause for apprehension in the rapid growth of enrolments in education above the secondary school level. On the surface this appears to be in contradiction to the generally accepted belief that increases in the educational level of the nation's population are not only desirable, but essential, if we are to create the kind of society to which most Canadians subscribe. It should be clear at the outset that the threat of increased numbers of post-secondary students does not reside in the numbers of students we educate, but rather in the implications of vastly increased enrolments on all aspects of our economy.

This paper will describe the growth in educational enrolments over the past few years with particular reference to the post-secondary level. Projections of enrolments over the next decade, taken from Staff Study Number 25 of the Economic Council of Canada by Zsigmond and Wenaas, provide the basis for the fears which are expressed as part of the title of this paper. The rise in total educational costs will be described and the specific costs related to the post-secondary level will be stressed. A projection of possible expenditures for post-secondary education will be provided with some of the implications that should be considered if these costs escalate at the anticipated rates. Included also will be a projection of enrolments at all levels of education with possible costs up to 1980. Finally, some alternatives will be proposed as possible solutions to the problem of providing higher education at costs which are within the range of possibility.

It should be made clear that the views expressed in this paper are entirely mine.

The enrolment statistics are taken from published DBS material; the projections are those which were published by the Economic Council. The financial data are derived from published documents; the projections of costs are mine. They represent nothing more than an extrapolation of existing trends.

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*This edited version of Dr. Wisenthal's paper omits the Tables and Appendices provided in the complete text. Persons wishing to obtain the complete text should contact the Education Division, Dominion Bureau of Statistics, Ottawa, for a copy.

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Enrolment Growth

The forces which have contributed to the spectacular rise in educational enrolments over the past decade include the increased post-war birth rate, broadening of the secondary school curriculum with a resultant increase in retention rates, greater accessibility to university, and the creation of community colleges with their wide variety of courses leading to wider career choices. Transcending all of these is the great Canadian dream of upward social mobility which is attached to a diploma or a degree. The Canadian public has developed a set of expectations which can only be met by the provision of more opportunity for more education beyond the secondary school level.

An examination of enrolment growths over the last decade reveals that the educational enterprise has grown to be Canada's largest "industry". It now absorbs over 6.3 million students at all levels; over 300 thousand full-time teachers are required to provide instruction; some 200 thousand non-teaching personnel are required to service educational activities. In other words, of all the men, women and children in Canada, one in every three is in formal education at some level in some capacity or other. This says nothing of a growing army of students enrolled in part-time education and a large number of part-time teachers.

If one analyses enrolment statistics by educational level one is immediately faced with the fact that the curve for post-secondary education is rising at a much faster rate than that for education as a whole. Table I is extremely revealing; by using enrolments in 1961 as a base year one can measure the magnitude of growth in enrolments by level of education during the past decade.

It will be noted that total elementary and secondary enrolments have increased by less than 30% from 1961 to 1969, while the post-secondary student population has risen by over 250% during the same period. The most spectacular rise, however, is in the number of students seeking post-graduate degrees (up 423%). In absolute terms these latter make up a relatively small proportion of total post-secondary enrolments, but they are indicative of growth at a level of education which is extremely important for future manpower needs of the universities themselves and for Canadian society as a whole.

The indices provided for the years 1975 and 1980 are based on the assumption that no interventions will be made in the post-secondary field which will inhibit the trends which have developed over the past decade. This, of course, implies that the same measure of support which has characterized the past decade will be available in the next.

To suggest that post-secondary enrolments could rise to nearly six times what they were in 1961 is not to predict that this will occur as a matter of course.

However, there are compelling reasons which make a projection of this magnitude acceptable, <u>if</u> no significant changes in policy are implemented.

Table II provides actual post-secondary, full-time enrolments for the period 1961 to 1969, and projections for the decade 1970-80. During the period 1961-69 total numbers in all post-secondary education rose from 193,500 to 479,900. This total could more than double in the next ten years to 1,130,000.

Table III shows the extent to which the relevant age groups have participated in post-secondary education, and the levels to which this participation rate could rise by 1980. If enrolment in post-secondary education continues to grow at the speed which is anticipated, it is entirely possible that more than 50% of the 18-21 age group will be in some form of full-time post-secondary education by 1980. This raises a number of questions related to human abilities and the normal distribution of IQ, and the kinds of post-secondary education which are appropriate for individuals of "average" intelligence. Certainly the traditional view would reject the assumption that over half of the 18-21 age group could profit from education, as we presently know it, beyond the secondary level. However important this matter is, it does not fall within the stated purposes of this paper and thus will be left for others to consider.

Growth in Expenditures*

An examination of the tables and charts, provided in the appendix, underline the magnitude of the educational enterprise both in terms of dollars and people. It is readily apparent that education is Canada's largest industry. The "cash flow" in education is substantially larger than that of any single industry. No activity in Canada can lay claim to the utilization of over 20 cents of every tax dollar collected from all sources by all levels of government. Few developed countries of the world can point to as high a percentage of GNP dedicated to education. Even the United States cannot claim 8.5% of GNP for education as we did in 1969. This amounted to 6.9 billion dollars in the fiscal year 1969-70.

Table IV underlines the rise in expenditures for post-secondary education over the years 1961-69 and provides a projection of cost levels which might be reached by 1980. It will be noted that total university costs in 1969 were 5 times greater than they were in 1961 with an enrolment increase which was only 2½ times above that of 1961. It is anticipated that full-time university enrolments could rise to nearly 6 times the 1961 levels; this could result in a total cost which will be over 31 times greater than that of 1961. In terms of increased cost per student, it will be seen from Table V that these have risen by a factor of nearly 2.2 and that there is every likelihood that this will rise at a more or less constant rate; by 1980, per-student cost at the university will be nearly 5½ times greater than it was in 1961.

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*All projected costs include a 5% inflation factor.

Table IV-A provides a striking example of the relationship of post-secondary costs to GNP. It will be noted that during the period 1961 to 1969, post-secondary education moved up by a factor of nearly 2.5, as a percentage of GNP. It is not unreasonable to anticipate a somewhat similar increase over the next decade. If this materializes we will be devoting nearly 3½% of GNP to post-secondary education by 1980. A formidable sum indeed, considering that this will represent the cost of providing education for less than 18% of the total student population at all levels.

In actual dollars, it appears that we can visualize an 8.3 billion dollar expenditure in 1980 for all forms of post-secondary education.

Actual expenditures per university student in 1969 were nearly $3,600; it is entirely possible that the cost of educating the average university student in 1980 could be close to $9,000.

Regretfully, the dollar data available on post-graduate education are not of sufficient quality to permit any meaningful analysis. It would be of great value to know what costs are related to what levels of university education by discipline and by year of study. It is hoped that improvements in university financial reporting will make this possible in the near future.

Implications of Projected Enrolments and Costs

It would be impossible, within the limited scope of this paper, to explore in depth all the implications of the projected enrolments and related costs; however, it may be useful to raise some questions about the possible effects of trained manpower outputs of the magnitude anticipated; to query the capacity of our society to provide occupational opportunities for the mix of skills which the graduates of the 1980's will possess.

The recent trend toward vastly increased enrolments in the social sciences suggests a growing concern on the part of the Canadian under-graduate with the nature of society and man's role in it. One can hardly quarrel with the desire of young people to engage in a process of discovery of self. But what opportunities will exist for economic utilization of self-knowledge and the skills associated with inter-personal relationships? What will be the market value of an under-graduate degree in sociology, anthropology, political science or psychology?

Perhaps these are not the appropriate questions to pose, but if we face a 1980 society not grossly unlike that of 1970, these are some of the questions which must be answered.

It would appear that there is a critical need for immediate examination of future skilled manpower needs. While it is true that futurizing about the nature of society, its productive machinery, its products, and their distribution, is an extremely hazardous business, some planning is essential if we are to avoid creating a situation in which literally hundreds of thousands of young graduates face a future of dissatisfaction as a consequence of expectations which do not match the reality they are called upon to face.

On the financial side the difficulties to be faced are equally complex. It appears that an annual expenditure in 1980, for post-secondary education alone, which could be 20% greater than the total cost for all

education in 1969, is likely to be beyond the capabilities of our economy. Total educational expenditures per capita have tripled over the past decade. Can this rate continue unabated without sacrificing other important social programs? Will Canada have to choose between health services or old age pensions and education? What proportion of total GNP can be dedicated to education without starving other needed developments?

Expenditures for education at all levels could rise to 23 billion dollars by 1980. Can our GNP grow fast enough to keep pace with escalations of this magnitude? Clearly this has not been the case during the 60's. What steps can be taken to ensure that some degree of balance is maintained between educational needs and the capacity of our society to respond to these needs?

Difficult questions do not usually lend themselves to simple answers. The questions related to the financing of post-secondary education are extremely difficult indeed. Answers are not readily available. Despite the lack of suitable solutions, there are some signs that immediate solutions are being applied. The recent announcement in some quarters that some differential treatment will be accorded out-of-province students is an indication that steps are already being taken to limit growth and escalating costs. No attempt is made on the part of the writer to sit in judgment on the action planned, but it is not inappropriate to raise the question of the consequences of discouraging interprovincial movements of university students. If indeed we do believe that Canada is a nation, can we further the cause of national unity by inhibiting interprovincial transfers of university students? On the contrary, the cause of Canadian unity may be served better by encouraging the youth of the Atlantic Provinces to register in universities in Western Canada while those of the West take their places in institutions on the Atlantic coast.

Possible Solutions

It is highly unlikely that any single solution will answer the complex of problems that relate to the financing of higher education in Canada. There is a variety of actions which can be considered.

1. Educational Efficiency

The term "efficiency", as normally employed, has objectionable overtones to most people associated with post-secondary education. And rightfully so. An educational institution is not a manufacturing plant where one can apply simple measures of productivity, effectiveness, costs and benefits. It is naive to expect that a university can turn out graduates with particular degrees in the same way that consumer products are manufactured. The human organism is incapable of being stamped, moulded, buffed, polished and packaged like the hub caps on cars. However, there is little excuse in the year 1970 to retain all of the instructional methods associated with the University of Bologna, A.D. 970. A thousand years of technological development cannot be dismissed as irrevelant to the university. Communication strategies, employing modern electronic devices, have made a wide variety of teaching activities completely redundant.

An enormous gap exists between the state of the communications and teaching art inherent in a variety of devices, and their deployment in education. The oft cited failures of ETV and CAI are not failures of technology but failures on the part of education to develop the appropriate strategies required to introduce modern devices. Salvation may not reside in the computer or in the multi-media carrel, but hell-fire and brimstone await without.

There are other ways in which universities can become more efficient in their utilization of scarce resources. From what one sees, minimal effort is made to coordinate the curricular offerings of universities. It is becoming increasingly difficult to justify the inclusion of courses in which the total registration is less than the maximum required for effective teaching. Recent developments in video tape recording, and computer assisted instruction suggest ways in which considerable savings can be effected.

Given the existing state of communications technology there appears to be no valid reason why national exchanges of courses of study cannot be arranged between institutions. This would have particular applicability to basic skill acquisition in exotic courses where the total enrolment for any single institution is too low to justify its inclusion on economic grounds.

It is not within the scope of this paper to enter into a detailed discussion of ways in which post-secondary institutions should move to reduce costs. However, it seems clear that unless the institutions themselves move quickly to become more effective managers of the teaching-learning environment, someone else will do this for them. In fact, there are already some signs that education is being offered for sale by entrepreneurs who recognize the existence of a market for their product.

At current levels of expenditures, education offers powerful attractions to commercial interests. Thus far, only the giants have entered the field in the United States. It would not be unreasonable to assume that "packaged educational deals" will be offered to provincial authorities who must face the realities of life. Realities include re-election.

2. Stretching Education

The belief that total formal education must be crowded into the beginning years of one's life is based on a set of unproven assumptions about human learning. In fact there is a growing body of evidence that maturity and motivation make an equally great contribution to learning as all other relevant factors put together. It should, therefore, be possible to create conditions in which it would be advantageous for students to spend every second year at work. Thus, a four-year undergraduate program would require eight years to complete. This would have the effect of reducing the total undergraduate enrolment by 50%.

Another educational phenomenon which is growing of its own accord is that of part-time enrolment. It should be possible to create conditions which would make it profitable, both for students and universities to encourage this type of education. There are no strong reasons why the post-secondary education processes cannot be extended over the working life-span of an individual. This type of continuous education would be most appropriate for those courses designed for the personal enrichment of individuals. Much of the course work related to the quality of life is rooted in the humanities and many of the social sciences. These lend themselves ideally to television, individual study, personally directed research and other learning activities which require a minimum of expensive space and staff time. Recurrent and continuing education present possible solutions to the dilemma we face and merit fuller exploration than they have had thus far.

The initiatives required for the full implementation of the powerful tools of communication and learning, which now exist in our technology, must arise from a coordinated effort by industry and education. The lack of a central focus for education in Canada presents a serious challenge to those who seek ways to launch national educational programs. However, it should not be beyond the wit of men of good intention, all of whom share common concerns, to create mechanisms which will permit the orderly and rational growth of Canadian education.

3. Learn Now - Pay Later

The notion of lending students sufficient money to pay the full cost of their education is not new. However, there is no evidence that this method of financing post-secondary education is widely used anywhere. To ask young people to assume a large debt before they have any prospect of employment is not entirely acceptable to some, yet it may provide a partial solution to the problem of financing post-secondary education. It should be within the realm of possibility to devise a method of imposing an educational surtax on the income tax returns of all graduates of universities. Is there anything fundamentally different between obtaining a mortgage on a house and mortgaging some part of one's future earnings?

In terms of demand on the economic resources of Canada, it makes no real difference where the dollars originate to pay the cost of university operations. The fundamental difference resides in who assumes responsibility for the repayment. As matters stand now students are paying approximately 1/5 of their educational costs; the balance is paid out of taxes borne by all citizens. I believe that it is necessary to recognize that a considerable, but largely unmeasureable, benefit accrues to society as a whole from creating larger number of highly educated citizens. It would, therefore, seem unreasonable to suggest that all the costs of post-secondary education should be paid for by the individuals who profit most directly. Existing fee structures place a disproportionate burden of post-secondary education costs on all taxpayers. A national education bank which provided all post-secondary students with a line of credit sufficient to pay a significant (80%?) proportion of the total cost of their education might go a long way toward permitting continued expansion of higher education. Repayment plans could vary with income and other criteria.

Need for National Planning

It is essential to recognize that education is a matter of provincial concern and that federal intervention is not desired. The autonomy of the provinces in matters of education has been clearly defined and requires no restatement here. However, there are areas of national concern which impinge on education where it is essential that national planning be coordinated.

Canadian unity is more likely to be realized if we encourage inter-provincial mobility of both students and teachers. We are unlikely to achieve a sense of Canadian nationhood by decrying the Americanization of our industries and university departments. Something positive is needed. What can be more positive than living and learning together? It might be well to consider the possibility of paying a premium for each out-of-province post-secondary student in direct proportion to the distance he is removed from his home province.

There are other matters of national importance which transcend provincial jurisdictional boundaries. Such areas as health care, pollution, and population mobility must be the concern of all Canadians no matter where they live. Education plays an important role in each of these and in many others. Given the existing division of powers between the provinces and the federal government, it is essential that some mechanism be created which will respect the autonomy of each of the provinces in education, yet allow for the implementation of educational programs which meet national objectives.

The embryonic structures already exist in such organizations as the Council of Ministers of Education and the Education Support Branch of the Department of the Secretary of State. The immediate problem is to devise a method for bringing these agencies together so that commonly accepted goals can be discussed in a non-partisan manner for the greater good of all Canada.

Conclusion

This paper has attempted to highlight the impending crisis which post-secondary education faces if no steps are taken to meet the challenge of the 70's. Rising enrolments and increasing costs have been documented as clearly as the data base makes possible. Projections of these costs and enrolments have been made, based on clearly stated assumptions. Some suggested plans of action have been put forward for consideration as possible alternatives.

VIDEO RECORDING AND PLAYBACK SYSTEMS

E. F. V. Robinson*

This paper will summarize information published to date with respect to five basic systems by which video material is being stored for replay through television receivers or monitors. The writer would have preferred that demonstrations of the equipment could have been arranged, including an opportunity to question the protagonists of each system, but that approach was not possible at this time.

All systems consist of a player which is of the order of two feet square and six inches to a foot deep which must be connected to a TV receiver or monitor -- in some cases a monitor may be included with the player. All systems will reproduce pre-recorded programs. Locally produced material may be prepared on film or video tape and after editing may be transferred commercially in specialized facilities to provide programs for any system. Four of the systems store the programs in cartridges or cassettes about 7 inches in diameter which the user slips into the player, the fifth uses discs. The film or tape in these containers is never exposed in use. The player is automatic and does any threading of the medium which may be required and rewinds it on completion.

So much for the similarities which will affect the user. While all systems are expected to be compatible with a standard TV receiver or monitor, they are mutually incompatible insofar as recorded program material is concerned.

The EVR System (Columbia-Motorola) uses a special cartridge containing balck and while film with pulse coded colour signals. In the player a flying spot scanner is used to feed the signals from the film into electronic circuits which provide the required signals to the TV receiver.

The Selectavision System (RCA) uses an embossed vinyl tape carrying a holographic image which is illuminated by a coherent light beam source and picked up by a TV camera tube. The signals pass into electronic circuitry which in turn feeds the TV receiver.

The Video Tape cassettes (Ampex, Avco, Philips, Sony) carry magnetic tape which is scanned by magnetic heads. The signal from these heads passes into electronic circuitry which again produces the TV receiver input. Unlike the systems described above this system permits the user to record his own material. A TV camera or a receiver may be used for this purpose. Pre-recorded tapes may also be played of course.

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* Mr. Robinson is a member of the Information Science Section, Radio and Electronic Engineering Division, National Research Council, Ottawa.

A fourth system uses 8 mm film cassettes (Nordmende) containing 8 mm film with a soundtrack. A flying spot scanner is used here too. It provides signals for the TV receiver after processing in the electronic circuits of the player. As this system is based on 8 mm film, it should be possible to have your own films placed in cassettes.

The Video Disc (TELDEC) stores the information on paper thin discs of PVC plastic nine or 12 inches in diameter. The disc has extremely fine spiral grooves with "hill and dale" impressions pressed into them. Each turn represents one frame of the TV picture. The disc is placed on a spindle which rotates it at 1500 or 1800 rpm. A piezo electric head with a diamond stylus is mounted on tracks above the disc and made to follow the groove by a mechanical drive system. The sound is coded and recorded between the TV lines and the whole signal processed in the electronic circuitry included in the playback unit for connection to a TV receiver.

In order to assess the relative usefulness of the various systems a potential user must have answers to a number of questions relating to his application. Some of these questions may be:

- Is there a need for real-time (creative) operation?
- Is on the spot recording required?
- How much is colour worth?
- Are cheap copies needed?
- How important is random access?
- Is a 'stop frame' facility required and should it be a feature of the display to make it applicable to more than one playback system?

A comparison of some characteristics of the five basic systems follows in tabular form.

	EVR	RCA	TAPE	FILM	DISC
Resolution	300 lines	250	250 - 300	250	300
Direct Recording	No	No	Yes	Partly	No
Stop Frame	Yes	Yes	Limited	Yes	Limited
Recording Medium	Special Film	Vinyl Tape	Magnetic Tape	Super 8 Film	PVC Foil Disc
Pickup	Flying Spot Scanner	Laser and Vidicon	Magnetic Head	F. Spot Scanner	Ceramic Pickup
Playing Time	50 min.B+W 25 min.C.	1 hr.	1 hr.	½ hr.	9"- 5 min. 12"-12 min.
Reproducer Price	$400.-$900.	$400.-$500.	$400.-$600.	< $900.	$150.-$300.
Program mtl.per hr.	$30. B+W $60. C	$4.-$10.	$20. - $30.	$30.-$60.	< $3.
Playtime/Copytime	< 50	< 50	< 50	< 50	> 1000
Access Time	under/hr.	not known	not known	not known	immediate
Available	industrial '70 consumer mid-'72	late '72	late '71	mid '71	mid '72

The times given for availability of the systems do not necessarily take into account the provision of adequate or even significant program material. It is apparent that a full choice of systems is unlikely under two years. It is possible that some degree of compatibility could be achieved if a firm position were taken by departments of education collectively, but the price and availability of program material with Canadian origin will be dependent largely on the extent to which we standardize.

THE IMPACT OF VIDEO PLAYBACK SYSTEMS

L. L. Samuel *

The long playing record revived an industry which had become stagnant. Its effect on the record player and record producing industry is now a matter of history. The inventor of this system was Dr. Peter Carl Goldmark who is now credited with the invention of the CBS Electronic Video Recorder system. Dr. Goldmark's thoughts on video playback systems are summed up in his statement " I think it's going to be the greatest revolution in communications since the book".[1.]

Time magazine states, "The nation (U.S.A.) has more radio receivers than people and more television sets than bathtubs. Now the third wave, the video cartridge (cassette) player, is about to break upon the U.S., and it could transform the cultural habits of the nation at least as dramatically as the first two".[2.]

The Japanese Electronic Industries Association, forecasting industries medium-term business plans, states that $2.42 billion of 1973's production will be accounted for by items such as cassette-based video tape recorders that are not now being mass produced.[3.]

American business leaders have forecast that by 1980 revenues for EVR will run from a low of $1 billion to a high of $3 billion.

The layman, when confronted with these facts, must assume that the arrival of this new device is not only imminent but overwhelming. Yet up to the present, little or no concern has been shown by Canadians as to the effect it will have on our cultural, social and economic life.

Those who have been exposed to these new developments feel that the video playback systems will be of considerable assistance to all educators and will have a place in skill-training, the portrayal of "hard to say" content, home study, library resource center, etc. The main advantages are the greatly reduced cost of the software over film, the high density of storage, and the ease of connection to a television set through which the data is viewed. The latter is of particular interest as it will permit the use of these video playbacks as the head-end of cable transmission systems similar to the IRTV system in Ottawa.

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1. Fortune Magazine, May 1970. 2. Time Magazine, August 10, 1970
3. Electronics, June 8, 1970

* Mr. Samuel is a member of the Electronics Division, Electrical and Electronics Branch, Canada Department of Industry, Trade and Commerce, Ottawa.

Up to the present, several different types of video playback systems have been announced, three of them using brand new technology. However, all of these systems are incompatible. The marketing strengths of the electronic industry giants will be fought at the consumer or user level and the winning system (or systems) will not necessarily be the best but the one which attracts the biggest share of the customer's dollar.

Perhaps the most disturbing aspect of the new media is the control of the software, that is, the type and content of the cassette material which will rest in the hands of the manufacturers. All major companies have been very careful to make it known that the "black boxes" can be built by anyone they care to license but that the processing of the tape, film or disc will remain within each company's control.

While the volume market is in the "home" movies, it is interesting to note that companies like CBS have initially concentrated in the industrial, educational and training market. They look at this market as having the greatest stability. The consumer or "home market" is thought to be extremely fickle with hard-to-judge reactions.

The initial market concentration of the other video playback companies have not been made public at this time but it is assumed that the education market will command more than a passing interest.

Since the educational and training market is to command considerable attention from this medium, it is of paramount importance that all facets of our community work together to gain the best advantage of this medium, and in some way, control and guide its development in an orderly and beneficial manner.

The interests facing the diverse sectors of our community are varied with industry, governments (federal, provincial, and municipal), education and consumer factions having their own vested interests and biases. It appears essential, therefore, that each of these groups work together to develop an organized approach, even to the extent of considering this a national goal.

While some of the developments are just now entering the marketplace, it will probably be 1972 before all the various technologies are available to permit a final choice. Therefore, it appears as if some time is available to us to plan and institute a unified and intelligent stand on video playback systems; however we must act now without delay.

If we assume that the consumer will make his own decision as to the system he wishes to purchase, it would appear that one means by which some kind of national program can be introduced is that of interesting the educational fraternity in finding a way to reduce cost and maximize compatibility by forming a united front. This united front should set up inter-provincial policies as to material content, exchange of programs, etc., relying on the federal government and its provincial counterparts to encourage industry to enter into production

of both hardware and software with industry availing themselves of the various incentive programs for the establishment of new facilities and support in R & D.

Education is a provincial matter and it is up to the provinces to consider and find the solution to the problem. The federal government's role, while limited, can be important in the area of industrial development.

If you share the view that this is a matter of urgent concern, then it behooves us all, as a group of interested Canadians, to act in a concrete way by advancing our individual views and concerns and in this way develop a plan to help us face the introduction of this new medium.

Our ultimate goal, which should include both short term and long term objectives, should be to develop a viable Canadian industry both for hardware and software. The establishment of this "new" industry should then serve each of our interests providing us with the "Canadian content" so important for the maintenance of our Canadian identity.

EDUCATIONAL TELEVISION DISTRIBUTION
A COMPARISON OF METHODS

C.A. Billowes*

Introduction

Any attempt to compare the various ways of delivering television programs to the classrooms in a school system is difficult for two reasons. First, because each system provides a different type of service, each with its unique advantages and disadvantages which are not directly comparable. Second, because no obvious basis of comparison exists.

A straightforward cost comparison will show which system is cheaper, but will say nothing about its overall merit. Conversely, an analysis which considers only the features of a system might be exeessively costly.

Pursuing this line of thinking further, an attempt was made to develop an overall figure of merit which included both cost and feature parameters so that direct comparisons could be made. This effort came to nothing when it became obvious that many of the system features had a wide range of values in the eyes of the perceiver and thus could not easily be fixed without much work to develop a consensus on their value.

This paper identifies the main methods of distributing educational television and their major characteristics. It contains a comparative analysis of the cost of each. Finally, a section on the cost of duplicating programs for several media is included so that the reader can see how the cost of duplication varies with quantity.

Basic Systems

The following is a list of the major methods of program distribution which will be considered in this paper:

Broadcast	- VHF & UHF Air Wave - 2500 MHz
Cable	- 1 channel on a CATV system - Private dedicated cable system of 12 channels - Instant Retrieval Television System
Video Record Player	- Single Centralized Library with several replay machines in each school

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Each of the above systems has unique advantages and disadvantages, some of which are of fundamental importance. The importance of some of the others is more a function of the objectives of the system planner and will vary in weight according to his views. Thus there is no "best system". Indeed, the individual characteristics of each are so varied that it is quite likely that the "best solution" for a particular set of circumstances is a hybrid of several of the above.

Main Features of Each System

VHF and UHF - Broadcasting

- universally receivable in the home as well as the school
- cheapest way of reaching a large population
- well suited for rural and sparsely populated areas
- insensitive to terrain and ground communication corridors
- must be a totally scheduled system and so is insensitive to individual needs
- no growth beyond one channel possible in many areas
- incremental cost of new receiving location about $250, i.e. cost of a receiver
- not essential to prewire school buildings
- not very suitable for higher grades of education where class or teacher rotation is practised.

2500 MHz Broadcasting - Same as VHF/UHF Brodcasting except:

- needs special receiving equipment so cannot be received in the home
- less coverage than VHF and UHF
- needs line of sight signal paths so is unsuitable if local terrain is rugged or high rise
- school buildings must be prewired
- a maximum of four channels are possible

Single Channel Carried by a Commercial CATV Operation - Same as for VHF Broadcasting except:

- only receivable by cablevision subscribers (unless a midband[1] channel is assigned)
- incurs the extra expense and difficulty of studio to CATV head-end link or links
- service is limited to territory served by CATV operator which may not coincide with school board jurisdiction. More than one operator may serve area.
- school buildings must be prewired
- unsuitable for sparsely populated areas
- unlikely to be able to expand

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[1]Midband channels occupy the frequencies 120-174 MHz which lay between channels 6 and 7 and are not receivable on an ordinary TV receiver without a supplementary tuner typically costing $50.

Private Dedicated 12 Channel Closed Circuit Cable System

- can accommodate some on-demand programming depending upon size of system
- system size limited to a radius of about 20 miles
- schools must be prewired
- not receivable by the public or home
- can evolve into a full on-demand IRTV type system with additional cables
- needs a large library
- unsuitable for sparsely populated areas

IRTV System

- completely user controlled
- needs a large library
- delivery of program typically possible within two or three minutes of request
- system size limited to about 20 miles
- totally free of scheduling difficulties or logistics problems

Video Replay Machines

Note

For the purposes of this paper, video tape recorders (VTR) and the newer technologies such as EVR have been lumped together because they perform the same function in the same manner. VTR, however, does provide the additional advantage of being capable of recording if camera equipment is added.

A price of $1000 per machine has been used in this analysis as being representative of both types in their cassette form (the new 3/4" VTR) and EVR.

- has serious program distribution problems
- requires the user to order in advance
- large libraries not yet available (particularly in EVR)
- local production only economic if a reasonable number of prints are to be ordered (EVR only - see attached graph)
- reliability of system lower due to lower reliability of machines
- wide range of service quality likely
- involves the operation of complex equipment in chalk dust-laden atmosphere by unskilled staff.

Cost Analysis

Distribution System and Library

This section of the paper concerns the cost of the various systems outlined. A model has been developed so that a basis of comparison exists.

While this model gives useful results, it cannot be too strongly emphasized that the costs yielded by this study are neither complete nor absolutely reliable. They do serve to illustrate the comparative costs of the distribution system and the library.

The Model

A city system of 80 schools has been assumed with an average school size of 15 classrooms for a total of 1200 classrooms. If the average classroom contained 25 students, the total school population would be 30,000.

Only the major costs of the library and delivery system for the programs have been considered. The total costs of each system would vary widely according to the way in which each was organized and administered and, in particular, as to whether it is possible to share the costs with surrounding school systems as in broadcasting.

Each solution analyzed gives a different type, quality and speed of service so it is not fair to merely compare the costs. The advantages and disadvantages of each system must be weighed in the light of the objectives of the user.

The costs used in the calculations have been obtained from a variety of sources and can be considered reasonably realistic. However, each solution contains a number of assumptions noted hereunder which do influence the estimates to a significant degree.

Each solution includes the cost of in-school wiring where it is essential and the cost of a TV receiver in every classroom. The results appear in Table 1. This Table breaks the costs down into two points -- a point which is relatively independent of the size of the system and a point which is proportional to the number of classrooms in the system. A third column contains the estimated cost of renting a cable facility. The estimated annual charges have been multiplied by three to give the estimated capital cost (this is a common rule-of-thumb way of computing capital cost of electronic systems from the annual rental). The rental estimates are not based on very much experience and would vary widely according to individual circumstances. They cannot be considered very reliable.

The final column in Table 1 gives the cost per student per year. For this case, the sum of columns 1 and 2 and 1/3 of column 3 were divided by 30,000 -- the estimated student population of the model.

Notes on the Systems Analyzed

VHF and UHF Broadcasting

A standard broadcast transmitter and its associated television recording and replay equipment. No allowance for program production is included. No consideration has been given to the question of licensing or ownerships. A small library valued at $40,000.

2500 MHz Broadcasting

A standard omnidirectional three channel transmitter system together with its associated program reproduction equipment. No studio equipment. Includes cost of special receiving equipment necessary at each school to convert signals into a form suitable for the standard receiver. A medium sized library of $120,000.

Single Channel Carried Free on CATV System

This solution assumes the equipment necessary to program this channel consists of two small replay machines and a single 2500 MHz studio-to-transmitter link. No costs are assumed for the carriage of the signals from the CATV head end to the school building utility room. School wiring and classroom receivers are included.

12 Channel Private Cable System

This solution consists of a single originating centre equipped with low cost (one inch) video tape recorders and telecine chains and the necessary channel modulators and control equipment. The cable system would normally be rented and the cost of this can vary widely depending on a variety of factors. The estimates used in this calculation are believed reasonable but cannot be considered highly reliable because little experience of this type of system exists. For the purposes of this paper, the cost of rented cable is assumed to be three times the annual cost.

The library required for such a system would need to be large because a 12 channel system has a voracious appetite. A cost of $480,000 for the library has been allowed which is not considered unreasonable for this type of system.

Information Retrieval Television
(Fully described in another paper of this Workshop -- see pp. 48-50.)

This cost has been derived from the experience gained in the Ottawa experiment. It assumes the same large library of the 12 channel private system.

The total cost of feeding each TV channel using the 1 inch VTR quality equipment is about $10,000. Because it seems likely that this price could fall as low as $3,000 in the next few years, a second calculation based on this figure has been included.

No allowance has been made for the cost of the telephone request system because it is felt that the ordinary school intercom and business telephone system can handle this in many cases.

The calculation for this system includes a factor for cable rental. This has been dealt with in the same way as in the previous system by taking three times the annual cost.

Video Replay

Assumes a large single centralized library with a daily delivery system by road. It has been assumed that this library also costs $480,000.[1]

In school, distribution can be by wire from a central location or by moving the replay machines to the point of use. The former is probably efficient for large schools while the latter is better for small schools.

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[1]One of the claims for this type of system is that the libraries are cheaper. However, much of the cost of a film or tape is contained in its production cost rather than its duplication cost. It seems likely then that the actual cost of a program on a library shelf will not change much from today's prices for one inch VTR on 16 mm. movie.

TABLE 1

TABULATED COSTS OF ETV DISTRIBUTION SYSTEMS

	Part of Cost independent of system size (Library plus Head-end or Transmitter) ($000)	Part of cost dependent on system size (TV receivers plus school wiring) ($000)	Part of Cost due to Rental of cable (Annual cost x 3) (City wiring) ($000)	TOTAL Capital Cost ($000)	Cost/student/year ($)
VHF and UHF Broadcasting	400	300		700	23.4
2500 MHz 3 Channel	440	420		860	29.7
1 Channel on CATV system	70	360		436	14.5
12 Channel private cable system	600	360	375	1335	36.1 ①
IRTV (10,000/channel originating center)	1480	360	675	2515	69.0 ①
IRTV ($3,000/channel originating center)	800	360	675	1835	46
Video playback	480	670		1150	38.3

45

① Calculated using only a one-year cable rental cost.

Duplication Costs

An important factor in any TV system is the cost of duplicate copies of programs. This cost has several components such as production costs, royalties, etc., which vary widely and independently of the length of the program.

This section only deals with the direct costs of duplication. The results are presented in the appended graph which shows how the various mediums vary in price with quantity of copies.

The data used in the preparation of this graph come from ordinary commercial sources and should be fairly representative.

Discussion

The value of television and audio visual systems is largely a matter of subjective judgment. Most teachers would probably agree that some exposure to audio visual is desirable and many have suggested to the author that up to 10% of the learning process could be occupied in this manner, with advantage, subject to suitable programs being available. Unfortunately, this type of instruction is almost wholly an incremental cost because it creates no savings elsewhere against which the costs can be offset.

Factors which appear important to the widespread acceptability of a distribution system are as follows:

User Controlled System - e.g. EVR in schools IRTV	Broadcast System - (Including Cable Casting) e.g. VHF 12 channel cable
- minimum delay between request and delivery	- suitability of programs for class schedule
- high probability that request is granted	
- ease of making request	

Both Systems

Quality of library catalogue
Size of library
Reliability of classroom equipment
Ready availability of classroom equipment
Ease of operation of classroom equipment

In any consideration of the merits of video replay distribution systems, it is wise to compare them with other non-television systems. The new video replay machines and VTR solutions are fundamentally very similar to 16 mm. movies in that the subject material is stored on a film or tape which must be moved around and replayed through relatively complex and costly equipment located at or near the point of usage. It is therefore fruitful to consider why these electronic solutions should be any more successful than 16 mm.

Two factors appear to be the cause of the relatively small use of 16 mm. movies in education. These are:

(a) the fact that requests on the library need to be made well ahead and even then the probability that the request is fulfilled is typically quite low

(b) the complexity of the classroom equipment together with the associated problems of erecting a screen, darkening the room and obtaining and setting up the projector (or the alternative of moving the class to a projection room).

The VTR and EVR solutions have two advantages. First, that no special efforts have to be made to prepare the classroom in the form of darkening, erecting screens, etc. and, second, that the replay equipment is relatively simple to operate, noiseless and does not need to be located at a fixed point in the classroom like a movie projector.

Movie film, in both 8 and 16 mm. formats, is certainly a less tidy classroom operation but it has the massive advantage of a large and ever growing program library. It also has superior optical quality and color.

No "best system" exists and each one discussed has some unique advantage. IRTV is probably the most effective system from the viewpoint of convenience and speed of delivery. Costs are expected to prove reasonable in terms of cost per program/hour in urban areas. However, IRTV cannot economically reach rural areas nor can it be used for self analysis like the VTR.

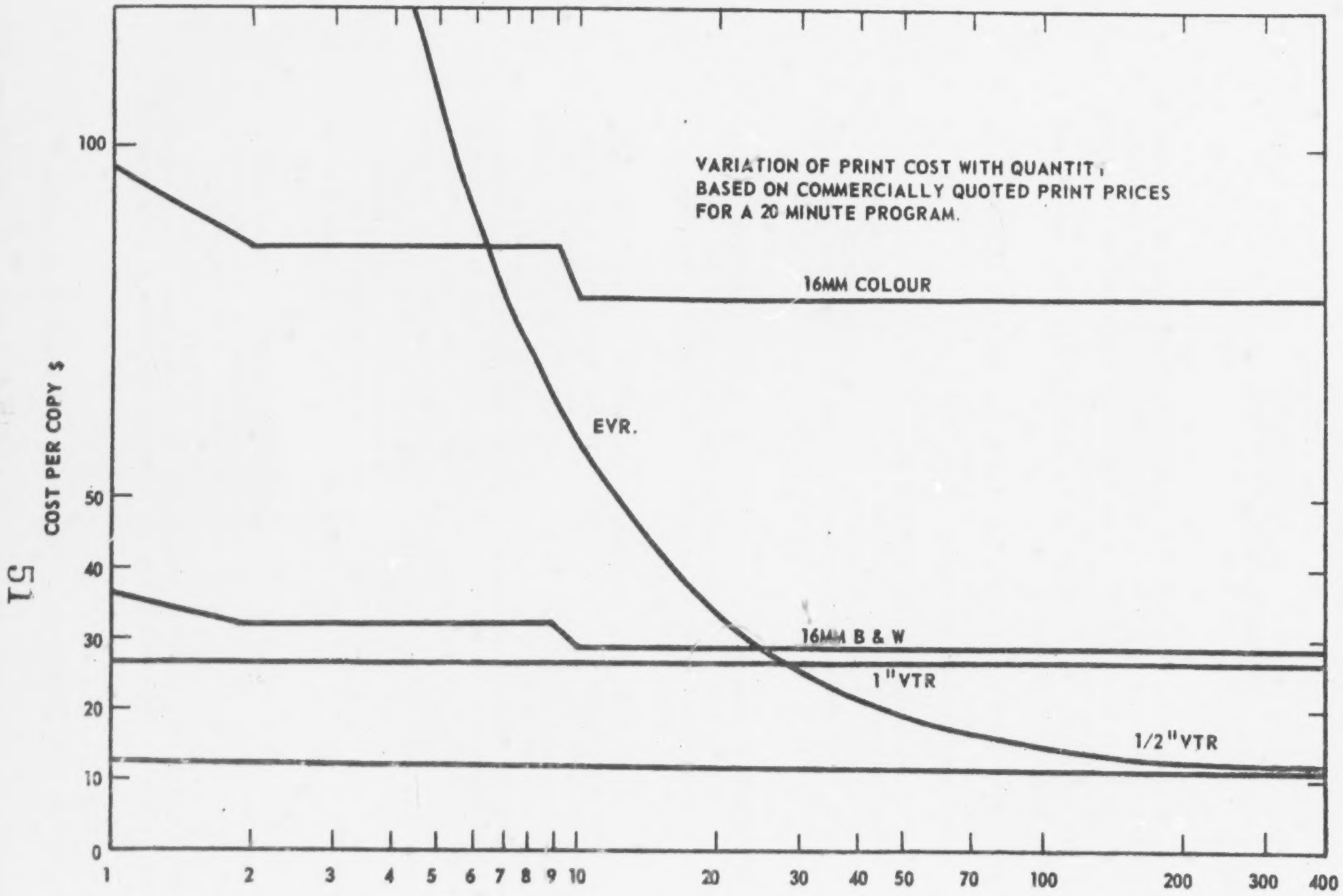
Air wave broadcasting systems of all types have similar characteristics of being able to reach a large population cheaply, but at the cost of being insensitive of their specific needs. Publicly accessible broadcasting is of most benefit to primary schools and adult education in the home. High schools where class rotation is widely practised can make less use of broadcasting because the schedule rarely fits the timetable.

Single channel ETV carried by the local CATV operator has the characteristics of broadcasting, but with a restricted and somewhat selected audience, i.e. CATV subscribers.

Dedicated cable systems can be fairly powerful and can evolve into what appears at this time to be the best solution - IRTV.

Video replay machines and VTR are as yet improper in a large system. A large amount of money is being spent on promoting them, which is causing them to develop an aura which they may not truly deserve. Like all solutions, they have their limitations and these must be recognized. The logistics problem of the software which has proved such a bottleneck for film still exists with this solution. The quantity and quality of the programs are likely to be limited for some years. Classroom equipment is very simple and seems likely to overcome the operational difficulties experienced by the classroom teacher in the use of movies.

In summary, it would seem that one gets what one pays for. Each system discussed has some unique advantage and it must be left to those responsible for educational television planning to match these features with their goals and objectives to determine which system or systems they will adopt. Poor planning in this field can cause very costly mistakes.


VARIATION OF PRINT COST WITH QUANTITY
BASED ON COMMERCIALLY QUOTED PRINT PRICES
FOR A 20 MINUTE PROGRAM.
16MM COLOUR
EVR.
16MM B & W
1"VTR
1/2"VTR
COST PER COPY $
100
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
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20
30
40
50
70
100
200
300
400
NUMBER OF PRINTS

INFORMATION RETRIEVAL TELEVISION

Dennis H. Dibb *

Most educators accept that audio-visual aids play an important role in the educational process. One problem that has faced educators for many years has been that of supplying educational and instructional material to teachers and students at times that are suitable and convenient to the user. In the main, three methods have been used to put such aids into the classroom:-

a) a school library containing filmstrips and film - these have of necessity usually been small and incomplete and not adequate for the needs of the school.

b) a school board central library containing films, film strips and other audio-visual aids which are distributed to schools on request. The objection to this method has been that the material that is needed is frequently not available at the time that a particular school requires it.

c) open-air transmission of educational material by means of television. The disadvantage of this method has been pre-scheduled programming which often does not co-incide with the needs of the user.

Several years ago, Northern Electric Research and Development Laboratories approached the Ottawa Public School Board with a request for a meeting with educators to discuss with them the possibility of using the resources of Northern Electric to research the use of certain technological aids in the field of education. Arising from this meeting came the idea of setting up a system whereby films and video tapes could be made available to schools on an on-demand basis which would avoid the difficulties mentioned above. It was suggested that, if some centre could be set-up whereby audio-visual aids could be disseminated into schools when the schools requested them by telephone, this could be a useful step forward in the adaptation of electronic technology in the field of education. As a result, a system was designed which provided for the immediate delivery of any program from a selection stored in a central location.

The system consists of an Originating Centre equipped with video tape recorders and telecine chains established in the Britannia Central Switching Office (Ottawa) of Bell Canada. This originating centre is connected by means of a 12-channel co-axial cable to five schools of the Ottawa Board of Education.. Each classroom in the schools is equipped with a 25" TV monitor and is connected by means of telephone to

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* Mr. Dibb is IRTV Co-ordinator with the Ottawa Board of Education.

the Originating Centre at Britannia. The Centre contains a library of film and tape numbering 2,700 titles and the teacher or student can ask for any of these programs to be transmitted immediately or at a pre-booked time. In the case of an immediate request, the typical delay between ordering and transmission is under one minute. For program selection purposes each classroom has a catalogue of the programs available in the library which by various indexing methods gives access to descriptive material about individual programs. The catalogue also provides an accession number for booking purposes.

The library of 2,700 titles (approx.1,500 on film and 1,150 on tape) has been assembled from numerous sources. The tape content in the main are programs produced in the Ottawa Board of Education TV Studio and programs supplied by the Ontario Educational Communications Authority. Film has been secured on a rental basis from various commercial suppliers and by free loan from industry, embassies and government departments. The total value of the library is in the region of $300,000.00.

Use of the system has been on an increasing scale since phase-in commenced in December 1968. In the school year 1969-1970, a total of 12,000 programs were transmitted and to date in the current school year transmission are averaging 70 per day. The peak daily figure has been in excess of 120 transmissions.

The system as it stands is experimental and over the two-year period of the experiment the Ontario Institute for Studies in Education has been collecting cost information and traffic data conducting interviews and other surveys of parent, teacher and student attitude towards IRTV. In June 1971, the Institute will produce a complete evaluation of the experiment.

Overall indications are that the system is effective and has been received by the users as a useful educational tool. It now remains to look to and examine the ways and economic feasibility of expanding the system to cover all schools in the city. This study will of necessity involve consideration of automation and as a step in this direction an experiment in the use of on-line booking is being conducted employing touch-tone computer input with voice answer back.

The participating bodies in the IRTV experiment and their roles are as follows:

a) Bell Canada - Northern Electric supplies all hardware (except TV monitors) used in the experiment. This includes telecine chains and video tape recorders at the originating centre and the participating schools, telephones and the wiring inside the schools connecting each classroom to the main system. They also provide technicians to maintain and operate the equipment.

b) The Ontario Institute for Studies in Education carries out the necessary research on the system in order to assess objectively the efficiency of its various points and the whole. It also investigates the costs of the system.

c) The Ottawa Board of Education makes the schools available for the experiment; supplies one TV monitor per teaching area; secures and supplies a librarian and assistant for the Originating Centre and a Co-ordinator and assistant to oversee the material placed in the library and to provide liaison with the schools and other participating bodies and to conduct the day to day administration of the experiment.

OBJECTIVES AND ALTERNATIVES FOR AN EDUCATIONAL DISTRIBUTION ORGANIZATION

J.R. McLorg*

This paper sets out some of the considerations involved in a framework for the distribution of certain educational materials -- by "framework" is meant an operating organization designed as one tool in bridging the gap between the classroom teacher and the agencies involved in the development of learning materials.

A wide range of agencies is involved in materials development. For example, there are probably 250 closed-circuit video studios in Canadian educational institutions. Many of the larger boards of education have curriculum development consultant groups. But each group is on its own and can contribute to only its own organization.

There is no overall framework aimed at putting their range of materials in the hands of the average teacher. And currently, there is little systematic cooperation between these resource pools. We have a limbo of duplicated effort.

An exchange or pooling of educational material based on cooperation could, with time, be an immense positive force in Canadian education.

Everyone is in favour of the circulation of educational materials. The difficulty comes in defining the scope and structure we need.

This paper cannot be definitive. It is merely a first approach to questions on the overall concept and structure of a distribution framework. An assertive approach is taken here. Only through different view points can we bring all the parameters involved to the light of day.

The use of the term, "Educational Distribution Organization" throughout this paper would add to its length, not to its clarity. To simplify matters, the initials of a possible name for the organization have been substituted, C.E.S. standing for Canadian Educational Services.

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Overall Characteristics - Objectives of the Organization

A "User Association" Base:

Some characteristics of organizations are not customarily expressed in formal descriptions. One of these is the underlying attitude or spirit that permeates the organization.

CES should regard itself as one service in a total system, a cooperative association that educational media users have developed to meet their common needs. The organization must keep close to the needs of the ultimate user. A "User net-work" might be the proper term. This expression reflects the needed spirit of cooperation and the sense of a common cause.

Low Cost - Small Size - Flexible Structure:

The venture should start on a small scale and experiment before developing an elaborate organizational structure or facilities. Size and elaboration brings inflexibility and an inability to respond to the real needs.

The cost of the organization (and of any play-back system used) is critical. Even basic classroom equipment is in short supply. We have not the funds to support an elaborate structure.

A scale-up in size can come later; but only when we are sure of the needs and when we have a viable operating system.

Provincial Control

It is obvious that nothing can or should pass to or from CES without provincial authorization. There is also a strong case for direct provincial control of the organization itself. Eventually, CES could become a major tool in education. Control of such a tool must lie with those responsible for education, the provinces.

This requirement would not preclude some initial cooperation between the provinces and industry in the start-up period. Nor would it rule out some form of financial assistance from the federal level. But in the long term, it must be possible for the provincial governments to take joint control of this tool.

Focus on Video Playback

Eventually, the distribution organization could serve the many educational technologies available; CAI, film strip, slides with audio, programmed instruction, community broadcast tower facilities, video playback, etc.

If CES tries to service all these media, its resources and strength would be dissipated. There would be no thrust, no action. A focus for its activities is needed.

It is proposed that the initial concentration be on the video playback generation. This is likely to be a fast breaking area in the next few years. Moreover, with this focus, CES can serve both video playback users and IRTV systems operating with this type of head end equipment. Services for other media could be added later. But let us do one thing well before we move on.

A Total Distribution Service

In the present amorphous situation, there is a range of services and needs that could be filled by CES.

- the gathering in and cataloguing of visual educational material
- the preparation of (mixed media) material to accompany the films and video tapes (ideally, teacher aids and/or material for student-media interaction should be available with each tape)
- the production of multiple copies of the original material
- the stockpiling and distribution of duplicate tapes and their related (teacher aids, etc.) material
- the provision of a system for the maintenance of the playback equipment

CES need not act on all aspects, but it should be capable of providing the services. Without a full service capability there is a danger of these services breaking out into a number of separate little operations. Operations which may not link together... A patchwork quilt with a new patch each time a need arose. What we need is the whole jig-saw puzzle, not miscellaneous and perhaps unmatched pieces. The term "Systems Approach" may be over-used, but in this case, it is relevant.

What services are supplied will depend on provincial wishes and presumably will vary from province to province. With their present organizations, and student populations, Ontario and Quebec would be able to meet most of their needs internally. Other provinces may have smaller student populations or special problems and may wish to draw more heavily on CES.

The intent here is to be able to provide an integrated system, not that all provinces will necessarily use the total system.

Deliberate Speed

Finally, it is proposed that we move with "deliberate speed". This doesn't mean that the organization should be incorporated in 3 months. But it does mean that the concept clarification work and the various discussion stages should be completed in the next year. In 1967, the establishment of a "Clearing House" for materials was the prime recommendation of the Conference on "Education and the New Technology". We have made little progress since then.

The video-cassette situation is upon us, with 5 different technologies and probably 8 non-compatible types of equipment. A small lively distribution organization with support from only 2 or 3 provinces could do much to bring some sort of order out of the potential chaos.

So much for the conceptual level objectives. These are not all the considerations or all the objectives; undoubtedly your team will think of others.

Alternative Structures for the Organization

There are a series of alternative structures open to us. The rest of this paper outlines some of these structures and compares them to the conceptual level objectives set out above.

1. Ad Hoc, Cross-Provincial Arrangements:

Under this first alternative, there would be merely ad hoc arrangements on an informal, person-to-person basis as opportunities are perceived.

This alternative appears attractive. There would be no need for discussion, cooperation or compromise.

However, one can question the reliance on informal arrangements and person-to-person contact. Is this the way to cover the ball park?

More crucial, the cost problems and technology involved in tape duplication rule out this approach as a feasible alternative. Three of the four main video playback systems require a high capital cost, high technology duplication facility. (EVR, RCA Selectavision and the Video Disc systems use advanced and elaborate processes to transfer the original material to a master device or tape. Then duplicates are stamped or run off quickly and with some systems, very cheaply.)

Operating individually, it is likely that a number of the Provinces could not mount the technology and effort required. But suppose they could; then we would have a massive redundancy of multi-million dollar plants and master devices. Short production runs would deny the economies of scale. For some material, the potential usage in any one province would be too small to warrant duplication.

There are major roles for the provincial level. One lies in the conception, development and testing of the master tapes and mixed media devices. Others are related to choosing the vehicles and exploiting their full learning potential as they enter the provincial educational structure. Without fulfillment of these roles, there is no point in a distribution system. But there is a cooperative function beyond any one province. Both overall roles are needed.

A "Clearing House" for Educational Materials

This alternative structure consists of a one or two man office, which would receive some notice of material and possibly a copy of the master tape. Periodically, the "clearing house" would prepare a list of materials and send it out to the participating provinces.

The alternative is simple and easy to accept. On a superficial look, it is almost seductively attractive.

However, under the clearing house structure, the main role is a coordination one. Little effort is available for searching out new material. Yet, from the experience in the Training Package Interchange (only 8 Canadian companies and 50 to 60 packages) we have found that the material collection role cannot be handled in a passive, "approach me" fashion. It is an active, seeking role.

It would be difficult to obtain 'commonality' in the descriptions of the packages or in their qualitative evaluation. (In the IRTV Experiment the cataloguing function was said to be "a tremendous problem".)

Teacher aids or student interaction vehicles could not be developed. Yet initially, we will have to work on the conversion of films designed for general purpose applications; films which do not meet the qualitative standards on student interaction that we strive for today. Other unfulfilled services were noted above.

A Private Company

A private enterprise company could provide the various services efficiently -- possibly at a lower cost than by some other means. Properly oriented, it could do the job quickly.

But under it, private industry would control an area of provincial responsibility. Ultimately, the responsibility must lie in provincial hands. Also it is doubtful that a private distribution organization, operating alone, would obtain the necessary cooperation from private Canadian and U.S. producers of film and tape. Eventually, it could become just another film distribution house.

Crown Corporation

Theoretically, a federally sponsored crown operation could be established to take charge of the prime distribution role.

The main problem here is the unacceptability of a federal orientation in the educational field. In the Canadian circumstance, control by the federal government could put the kiss of death on the cooperative spirit required for CES. Relationships with and liaison within the provinces could become extremely difficult.

There is also a time factor involved in this alternative. Crown corporations are not created overnight. We might not be able to work within the objective of "all deliberate speed".

Interprovincial Company

Under this alternative, CES would be set up as a cooperative effort between two or more provinces and an outside source, presumably a private Canadian company.

The provinces would supply the original material and mixed media packages for duplication. The Canadian company would supply the organizational

skills, capital, plant and technology. CES would be set up as a separate company responsible for tape duplication and such other roles as are worked out through discussion with the participating provinces.

The provinces would buy control as CES proves successful and settles down to a smooth operation. Under the conditions of the original agreement the private sponsors would have to guarantee their willingness to turn over equity, and to give the participating provinces representation on the board of directors.

This approach appears to be vulnerable to problems in the area of the trust relationships required. A series of hidden agendas and stand-pat positions could break the partnership and destroy the distribution organization.

Still, both industry and the provinces contribute in the sphere of their best talents. The approach appears to meet all prime conceptual objectives set out in the first part of this paper. And all distribution services could be provided under provincial guidance, eventually under direct provincial control.

Overall Concerns

This paper has assumed that there is an unfulfilled need in the distribution of audio visual educational materials. Like anything else, this assumption can be challenged both on overall aspects and on specifics. There are themes like:

1. Are we really creating a monster instead of a service?
2. Isn't this a mechanical approach to a human question?
3. Will this advance the true purpose of education?
4. We must consider the needs for involvement and cooperation across the educational community.

There seems little chance of creating a monster in place of a service. We are talking of an organization with a few people in a field of some 235,000 teachers. There is more chance for sins of omission than of commission.

There is a danger of a mechanical approach with any tool. One role of education is to help the individual reach the full potential of his being. Any misuse which detracts from this role would be unacceptable. But properly used, the tool could supply content and learning opportunities on a vast range of areas.

In some cases, we now cannot properly help individual learning. This video playback generation can help us break out of certain strictures of the classroom situation, to individual learning. For example, in adult-at-home learning, it could provide a whole new range of opportunities to the individual.

As for the need for cooperation and involvement, certainly we need cooperation and involvement, eventually to the teacher level. That is what this whole concept is about.

DISTRIBUTING EDUCATIONAL MATERIAL THROUGH VIDEOTAPE

R.A. Morton*

For years educators have been waiting for a device or technology which will make possible instructional resources that are not only useful in content and approach, but also accessible, simple to display, flexible and economical. Film in various formats, radio and television broadcasts and other media forms, have met one or two of the criteria but not all. While educators are continuing to use existing forms of media in a limited way they have been anticipating the arrival of a major device which will embody all the virtues.

Rationale

In Alberta we decided not to wait but to move ahead with videotape distribution. Whatever form of distribution emerges in the future, "software" will be essential. Therefore, our emphasis is on the production and acquisition of programs or instructional resource material. We decided that the "software" would be, for the most part, in videotape form.

Source of Materials

We have, therefore, produced or have acquired the rights to more than 600 program items. The major sources include Metropolitan Edmonton Educational Television Association, and Alberta School Broadcasts. In addition, some of these programs are films for which we have acquired the rights to videotape and duplicate for distribution within a limited period of time. These form the reservoir of instructional or learning materials which are being distributed.

Operation

A catalogue has been prepared and is available to schools on request. Schools using the videotape service agree to abide by the conditions. Programs are selected from the catalogue and the orders are sent to the "dubbing" centre together with sufficient blank tape to receive the programs from the master tapes. In the centre the requested programs are dubbed and returned to the schools on their own tapes. Two to three weeks are required from the time the order is sent until the completed tape is returned.

Dubbing services are presently available on Sony one-inch and half-inch formats and Ampex one-inch formats. We expect in the future to limit the dubbing service to machines which incorporate international standards so that the number of dubbing formats can be reduced. Master programs are stored on one-inch tapes.

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Demand

A demand is increasing each week and we are having some difficulty in meeting all the requests within a reasonable period of time. Already more than 400 videotape recorders are in Alberta schools and more are being purchased largely because the service is being offered.

Other Distribution Modes

Generally, the videotape service does not operate within the signal range of Channel 11 in Edmonton, which broadcasts 40 hours of educational programming each week. We feel that schools with videotape recorders within this area have access to a large number of programs, including some which are also stored in the dubbing centre. In addition, our reservoir of programs is available through Calgary's limited 2,500 mhz system reaching 26 schools. Arrangements are being made for distribution through existing cablevision systems and through those which are now being developed.

In summary, there are a number of advantages and disadvantages to distributing educational material through videotapes.

Advantages

1. More programs will be available at the time wanted by the teacher.

2. Videotape is re-usable.

3. The production of material for VTR is generally less expensive than for the film format.

4. The addition of a camera makes the videotape recorder a useful instructional instrument.

5. Distribution of videotape materials can be done through a variety of modes -- the tape itself, broadcast, cable, etc.

6. Videotape material is easily piped from a central VTR source to classrooms or carrels.

Disadvantages

1. The small television screen is a disadvantage for a standard class size.

2. Programs in black and white, while the most economical to produce and distribute, may not be as effective in some instances as programs in colour.

3. There is inevitably some loss in picture detail.

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APPRNDIX/APPENDICE

"A Framework for the Exchange of Visual Educational Material"

RESEARCH PROPOSAL

A FRAMEWORK FOR THE EXCHANGE OF VISUAL EDUCATIONAL MATERIAL

This proposal is aimed at exploring the possibility of some mechanism or "clearing house" for the exchange of Canadian visual educational materials. The main means of exploration would be a series of integrated, sequential discussions with the appropriate people and authorities across Canada. Areas involved in this exploration would be the different views on the need, or lack of need, for such a framework; alternative mechanisms and terms of reference for it; and finally, an exploration of the possibility for some consensus on willingness to participate amongst the Provinces and independent post secondary institutions.

Background

A workshop conference was held in November 1970 on the "Distribution and Use of Electronic Aids in Education". Involved were participants from Education, various Governments and Industry. A prime conclusion of the workshop was that some "clearing house" or framework for the exchange and distribution of educational material was needed in Canada. This conclusion came out of the analysis of two general situations:

1. There appears to be a distribution gap between the teacher-in-class and the various agencies developing audio visual material. There are some 250 closed circuit video facilities in Canadian Educational establishments. Each facility is on its own and usually services only its own organization. There is no systematic approach aimed at putting their range of material in the hands of the average teacher.

   As far as inter-organization needs are concerned, the storage and dissemination potential of the video medium has not been fully used. With the absence of some exchange mechanism, each facility must develop its own complete range of audio visual aids. We are in danger of wasting our resources by re-working the same areas for many different institutions. As one workshop participant put it, we will keep "re-inventing the wheel".

2. The general audio visual hardware-software situation has been chaotic. This situation is expected to develop and harden rapidly. If measures are not taken now, Canadian Education could be locked into chaos in this aspect for the next generation. There are between 300 and 500 companies distributing audio visual hardware and software in Canada. In effect, each additional organization adds its own little bit of confusion in hardware or software to the chaos. School Boards and Educational institutions are faced with equipment purchases that lock them into limited software resources and specialized applications.

   A new generation of video playback equipment will be introduced in 1971 and 1972. This generation will be marketed by major international consortiums of companies; companies that can and plan to make strong sales efforts in the Educational market. This generation of equipment meets many audio visual requirements and it will be most attractive to the Educational community. But again we face five completely different technologies and perhaps seven or eight incompatible systems sold by the various major competitors. Tapes made for one system (or one school board) cannot be played on a second system. Once commitments are made on these various video playback systems it will be difficult, if not impossible, to have a viable interchange of material.

Study Scope & Design

In terms of both scope and design, the proposal study can be compared to an inverted pyramid. It would start with discussions on the broad general situation and work towards commitments on the exchange of materials.

In the first set of discussions contacts would be made, through the Provincial Departments of Education, with the broad range of organizations and authorities in the Educational community involved in the A-V field. The discussions would range over this general situation. In the second and third stages the number of contacts would be more restricted and the discussion content would start to focus on the key aspects involved in the distribution of the visual educational material.

Overall we would be testing for interest in an agency for the distribution of educational materials. In the Canadian context this is a decision to be made by the provinces and provincial views will determine action. However, it should be noted that only two or three of the ten provinces need to agree before a viable exchange system can be organized.

An outline of the study stages and discussion areas follows:

Phase 1

Initial discussions would be held with the curriculum and audio visual media groups in the Provincial Departments of Education, and through the Provinces, with a small number of Metropolitan Boards. Discussions would also be held with materials development groups such as the Ontario Educational Communications Authority, META, Radio Quebec, The Calgary Authority, etc. Post secondary interest should be explored; at least 15 of the major universities would be contacted.

The subject content would be:

A) An exchange of views on the overall audio-visual situation.

B) General and special Learning needs related to the audio visual field.

C) Needs in the materials production area.

D) Interest and factors involved in the exchange of educational material. What is going on now? What will be needed in the next few years?

It is probable that some written background material will have to be distributed before meaningful discussions can take place at this initial stage (e.g. the paper by E.F.V. Robinson: "Video Recording & Playback Systems").

This phase would end with a summary of the cross-Canada views being sent to the participants in the discussion.

Phase 2

The second round of discussions would be limited to Phase 1 participants who have expressed direct interest in the general situation.

Proposed Content:

A) An exchange of views on the detailed equipment requirements in the various educational situations.

B) A review of possible objectives, terms of reference and alternative structures for an educational materials exchange agency.

Again a summary of views would be prepared and sent out to those participating. This summary would contain draft proposals on mechanisms for the exchange of educational materials.

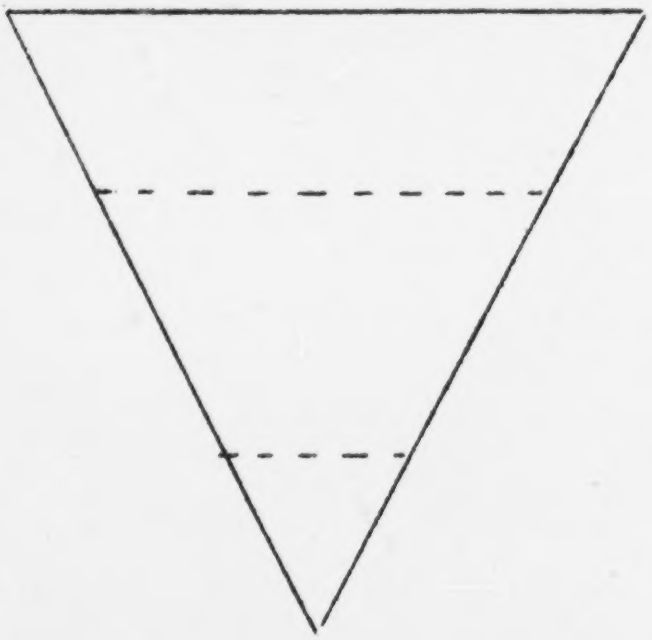
Phase 3

A third summary round of discussions would be needed to ascertain possible commitment towards some form of operating organization engaged in the distribution of audio visual materials.

There would be a further work towards sample listing of exchangeable materials with organizations that express the possibility of commitment on an exchange.

Overall Aspects

In summary, the proposed could be diagrammatically presented as follows:



Stage 1: Initial Discussions:

-Overall A-V situation
-General interest in the exchange of materials.

Stage 2: Second series of Discussions:

-Requirements in Teaching Situation for Video Playback Equipment.
-Possible terms of reference, Services rendered and structures for an Educational Distribution organization.

Stage 3:

-Recommendation on Structures and terms of reference for organization
-Exploration of commitment to participate
-Availability of materials.